THE

TROPICAL AGRICULTURIST

VOL. LXII. PERADENIYA, JANUARY, 1924. **No. 1.**

AGRICULTURAL PROGRESS.

The opening of another New Year would appear to be the fitting opportunity to refer to some of the directions in which it is hoped that the Department of Agriculture will expand during the next twelve months.

The year should see the completion of the new Chemical Laboratory and provision made for an extension of research work in agricultural chemistry. The value of such work should be considerable and the agricultural industries should stand to profit by it.

Discussions will take place early in the year in regard to the establishment of Research Schemes for the Tea and Coconut industries. The Scheme which has been in force for some time in co-operation with the Rubber Industry has progressed satisfactorily and has produced work of considerable value to the Rubber Industry.

Similar schemes on a co-operative basis appear to be desirable for the two other capitalistic industries and it is expected that it will be possible to launch them at an early date. The tea industry is at present prosperous and therefore is desirous of establishing its research work on a sound basis. Similarly the coconut industry expects a year of good crops and is desirous that more scientific work should be done for it.

For the paddy industry, the work of the Economic Botanist in raising improved varieties will be continued and encouraged, and further trials will be made with the employment of green manures in paddy cultivation. Demonstrations will be continued and competitions increased and otherwise encouraged.

The Plant Pest and Disease Legislation is at present under amendment and it is hoped subsequently to put this work on a more satisfactory basis. The agricultural industries recognise the importance of this side of the Department of Agriculture's activities and it is felt that the fullest support from those industries can be relied upon.

The experiments which have been carried out with cotton have been most encouraging and it is intended to secure as early as possible further expert advice and then to make further experimental trials with this crop in other parts of the Colony. The approaching shortage of the world's cotton crops demands that serious attention should be given to this crop in all areas in which it can be grown. There is no doubt that considerable areas in Ceylon are suited for cotton cultivation and therefore every encouragement should be given to stimulating such a possible new industry. The trials with sisal will also be continued and the possibilities before roselle—which has given most encouraging results on the Peradeniya Experiment Station—tested.

At the Agricultural School, Peradeniya, a new departure will be made by the establishment of a small model dairy and the year should see the completion of the buildings for the Agricultural School at Jaffna in the newly opened Experiment Station. Poultry-keeping is also being started and endeavours will be made to make the agricultural courses as practical as possible. Scholarships are being offered to some of the successful students who have passed through the full course at the Agricultural School, Peradeniya by a Proprietary coconut planter for practical training in coconut cultivation and two such students begin work in January.

It will be the endeavour of the Department to keep the agricultural public informed of the results of experiments, researches and investigations through its publications and endeavours are to be made during the year to improve the general character of the TROPICAL AGRICULTURIST and of the Department's Vernacular Publications. The publication of the Year Book which met with considerable appreciation last year will be continued and some of the results of the work of technical officers published therein.

Progress must be the keynote of the agricultural industries and this progress is dependent upon research, education and instruction.

RUBBER.

BUDDING OF HEVEA.

The Director of the Plantations Research Department of the United States Rubber Plantations, Ltd., Kisaran, Sumatra, kindly sends us the appended article he has translated from the "Ned. Ind. Rubber on Thee Tijdschrift" of September 1. The article is signed "G. F. B." which we venture to presume stands for MR. G. F. BODDE, who was until a year or two ago in charge of the well-known Pasar Waringin Estate. The article is headed "Two different Opinions" and is as follows :—

In the July issue of the "ARCHIEF VOOR DE RUBBERCULTUUR" there appeared as a communication of the A.V.R.O.S. Proefstation, a lecture, held by MR. J. G. J. A. MAAS on "Modern Rubber Cultivation," which expresses quite a different opinion with regard to the problem of budding than DR. A. STEINMANN'S lecture, held in the general meeting of the Rubber Planters' Association at Bandoeng, which was printed in the same issue of the "Archief." The opinion of DR. STEINMANN is based on experiments made on Pasar Waringin and Bodjong Datar ; whereas MR. MAAS mentions the results of Experiments on (1) Pasar Waringin, (2) Bodjong Datar, (3-4) H.A.P.M.. (5) Melamboe, (6-7) another estate not named, (8) Bandar Bedjamboe and (9) Proefstation A.V.R O.S. (provisional announcement of tapping experiments by DR. HEUSSER).

The tapping results of Pasar Waringin, given by both lecturers, do not entirely agree, but the differences are so small, that the different opinions of the writers cannot be ascribed thereto but must be ascribed rather to a different valuation of the data available.

OPPOSITE OPINIONS.

We will not take the part of either opinion and confine ourselves to putting some of the conclusions of the learned writers against each other.

DR. STEINMANN is of the opinion that—

"One will be wise, provisionally to draw the conclusion, that the difficult and expensive process of budding, at least for the laying out of tapping gardens, will very probably not be worth the expense" (page 293), and on the next page :—

"The future of budding with Hevea cultivation, as is the case with the tea growing, will probably lie in the formation of Seed Gardens in order rapidly to obtain a collection of the very best mother trees, which, by natural cross fertilisation, supply superior seed."

MR. MASS is of the opinion that :

1. "The budded trees on Pasir Waringin, had a larger average producing capacity than the seedlings from illegitimate selected seed with which they were compared (page 279). 2. Buddings originating from the better mother trees, thus produce considerably more than

seedlings of equal diameter (page 279 at the bottom). 3. So far, the results obtained on various estates with their own selected budding material are in agreement (page 282). The provisional results of the tapping experiments that DR. HEUSSER is now making on buddings from trees selected by himself show that probably still better results may be expected from the proefstation-selection material. "It appears to me, that already we may expect an important increase of production from the budding material we have now at our disposal in comparison with unselected seedlings" (page 283).

F.M.S. OPINION CRITICISED.

Also on the other side (the F.M.S. and S.S.), opinions concerning this problem differ. We think it useful, to put against one another some verdicts, which we found in the MALAYAN TIN AND RUBBER JOURNAL.

Last month, MR. BELGRAVE, Plant Physiologist of the Department of Agriculture, held a lecture on budding, of which we quote the following:

"The current opinion that budding of Hevea, from analogy of results obtained with other crops, would *a priori* come up to expectations, was disputed on the following grounds:"

1. Budding has proved a failure with many cultivation crops, such as cacao, sugar-cane and tea (?).

2. There is not a single indication, that the stem plays a more important part in the flowing of latex than the roots, since there is no characteristic property of the former known, which has a considerable influence on the production.

3. It is not proved that the reduction is a characteristic hereditary character of the tree, and that it is not to be considered much more dependent upon external factors.

Further, he lays stress on four possible disadvantages connected with budding, *viz:*

(a) the costs may prove to be more than the contemplated increase of production.

(b) the point where the bud grows together with the stock will always remain the weak point.

(We recollect the following occurrence from our field experience: Some 30 very promising two-year-old budded trees were badly damaged by a whirlwind. Most of the crowns were totally destroyed and some trees were broken off on 1 or 2 meters high. It was striking that not a single stem was broken lower than 1 meter. In connection herewith some of the lost trees were put to a test. The decapitated stems were bent downward, while we braced ourselves against the base of the trunk, but we never succeeded in breaking the stem at the place where the bud and stem grow together. In most cases the breakage took place above it, and some times the understem broke, but the junction itself withstood our efforts. It seems that the tissues which constitute the junction strengthen the point of attachment in such a way as to make it extra strong. It is a common knowledge that a broken arm or leg, provided that it is well set, will never break at the point of the old fracture).

(c) vegetative multiplication usually results in degeneration, for which as a proof is adduced...that marcots (tjangkoks) have been found, which were affected by white ants!

(d) If the mother tree is extra sensitive for certain diseases, the risk is run, that the whole clone will be afflicted by it and it is pointed out that the occurrence of Brown Bast often accompanies a high production.

As something very remarkable it is mentioned, that the H. A. P. M. plants its new plantings nowadays of alternate rows of buddings and seedlings, from which MR. BELGRAVE concludes that the success of budding with that cultivation company is doubtful.

Comment is here not necessary.

MR. H. GOUGH'S CRITICISM.

In the following issue MR. H. GOUGH criticises this lecture. With the first theory he agrees by granting that success obtained with other cultivation crops is no proof that the same must be the case with Hevea.

Regarding the second theory, he refers to the relatively large uniformity in the latex producing capacity of the members of the same clone. In view of the fact that these are put on all sorts of stems, which, unbudded, would have shown the same variable stand that characterises our ordinary plantings, he derives therefrom the proof that the properties of the stem and not the roots are impressed on the budded tree.

In dispute of the third theory, the verdict of DR. VISSCHER in the November issue of the ARCHIEF VOOR DE RUBBERCULTUUR is quoted in the following form:

"The productivity of budded trees stands in close connection with the number of latex vessels, and is equally an intrinsic hereditary faculty which is characteristic of the type."

Against the fear, expressed by MR. BELGRAVE, that budded trees may be more susceptible to Brown Bast than seedlings, the reasonable question is put, whether any planter for that reason would plant estates of low producers.

MR. GOUGH concludes his comment with the statement, that the method followed out by the H.A.P.M.: for the greater part, if not exclusively, is based on the advice of the former Director of the A.V.R.O.S. Proefstation. The latter gave him personally to understand that, in his opinion, by vegetative reproduction, even with our present incomplete knowledge, increase of production by 50 per cent. probably will prove attainable.

This is incorrect. The H A.P.M. adopted this method early in 1921 on the advice of its own Research Department the A.V.R.O.S. They would probably have given similar advice, however.

In connection with the above, the editor of the MALAYAN TIN & RUBBER JOURNAL is of the opinion, that:

"Any valuable conclusion arrived at in this connection will be a trump card in the hands of our friends across the Straits of Malacca if they get it before we do. If the Dutch in Sumatra and Java extensively produce a rubber tree which will yield 10 to 20 per cent. more rubber than our trees they will at once place the great rubber industry of Malaya in the background so far as efficient rubber-growing is concerned. It is, therefore, the

duty of the Government of the Federated Malay States, and the rubber growers, to see that we in Malaya not only keep abreast of what the Dutch in Java and Sumatra are doing in the way of improving the production of their future rubber trees, but also to see that we keep ahead of them. To do this, money has to be spent on scientific assistance and we repeat that this must not be grudged either by the Government or the rubber grower."

DEFINITE PROOF: 1,702 LB. PER ACRE.

We are authorized to communicate without mentioning any names the provisional results of a very promising tapping experiment on budded trees.

In February-March, 1919 a clearing was planted. All individuals in March last, when the experiment was started (thus at the age of 4 years), had reached a stem-thickness of 50 centimeters at 1 meter above the junction. Tapping was daily on a cut over the half circumference at 1 meter high. The average daily production has so far amounted to 67 cubic centimeters of latex. The best yielder gave daily an average of 80 cubic centimeters and the poorest one 56 cubic centimeters, a deviation upwards of 19 per cent. and downwards of 17 per cent.

With a planting system of 20 by 20 a rubber content of 33% and 350 tapping days in the year, this figure means a yearly crop per bouw of not less than 1,386 Kilos dry, and this at the age of four years (equivalent to 1,702 lb. per acre).

The pioneers, among whom we count ourselves, saw in vegetative multiplication the surest and quickest means to fix in the offspring the desired faculties of *each outstanding yielder*.

The results obtained thus far from tapping experiments on the first plantings, established by vegetative methods, seem to show that the original expectations, *ecpecially in their generality*, were on too high a scale.

Several trees, noticeable as good yielders, show in their vegetative offspring disappointing results.

Some mother trees produce a clearing of decidedly inferior individuals, but with some, among which is the example given by us, a striking agreement between latex producing capacity of mother trees and buddings cannot be denied, not to mention the striking uniformity in diameter, growth and individual production.

At the present stage we would like to lay stress on the following :—

Let our scientific advisers and our practical men renounce the preconceived ideas with regard to the usefulness of vegetative multiplication to make our future plantings more productive than the present ones.

If only one clearing comes up to expectations, proof is given that, in the cultivation of Hevea, the vegetative method of multiplication can practically lead to the desired result, and that is the main thing; that is what is at stake.

It is up to our scientists to investigate why this is not the case with all mother trees, and what problems it is worth while to consider and what problems not.

We have not immediately reached our goal, but this is no reason to turn back on our way, and to speak of a failure, when the alternative (*i.e.*; generative reproduction) on scientific grounds gives us an expectation of results at any rate doubtful and certainly no quicker.

Many extremely important problems in this field wait for a solution, many unforeseen difficulties may be encountered, and much effort is to be predicted, but in spite of all it is our conviction that increase of the productivity of our future plantings may be reached better and more surely by vegetative than by generative reproduction.—G. F. B.—MALAYAN TIN AND RUBBER JOURNAL. VOL. XII, NO. 19.

BUD-GRAFTING OF RUBBER.

SCIENTIFIC RESEARCH REVIEWED.

MAJOR GOUGH'S VIEWS.

MAJOR H. GOUGH, the well-known planter of Kajang, Selangor, who has hitherto been in the forefront of local planters who are taking a practical interest in bud-grafting of rubber, writes to the Press on the present position of affairs as dealt with in the editorial columns of the MALAYAN TIN AND RUBBER JOURNAL of last issue.

The report of the Secretary of Agriculture S.S. and F.M.S., in the section dealing with rubber, says referring to Bud-grafting:—

"The recent work, however, of Dutch scientists has shown that numerous difficulties remain to be overcome before this procedure can be relied upon to give satisfactory results on an estate scale."

Some of your readers may be interested to read a few extracts from the most important of recent Dutch papers on the subject and thus be able to form some sort of opinion for themselves as to whether any increase of yield is likely if bud-grafting is practised on an estate scale.

The most important pronouncements of Dutch scientists on this subject which have appeared recently are contained in the July number of their official organ, the ARCHIEF VOOR DE RUBBERCULTUUR. One is by DR. STEINMANN with an introduction by DR. BERNARD, the other is by Mr. J. G. A. A. MASS of the A.V.R.O.S. Experimental Station. Both seem to agree that old methods of planting are out of date. They argue, so far as I can judge as to which is best of the two acknowledged methods of very appreciably increasing yield, *viz:*—bud-grafting, or by sowing seedlings from selected trees. Of these gentlemen, DR. STEINMANN bases his deductions on the results obtained on two estates. Mr. MASS bases his on the results from the same two with the addition of seven others including the A.V.R.O.S. Experimental Station, and also on the result of his own investigations.

DR. STEINMANN, referring to the good results obtained by planting with seedlings from the seed of selected high yielders, and comparing them with the production obtained from bud-grafts, says:—

A DUTCH SCIENTIST'S OPINION.

"Therefore it would be advisable in the meantime to draw the conclusion that very probably the difficult and expensive work of bud-grafting, at least for the laying out of tapping fields, will not be worth the trouble."

A couple of pages further on he is somewhat contradictory and says :—

"About the value of bud-grafting for tapping trees we will however for the time being draw no definite conclusions."

In the above remark he is clearly comparing the results obtained from seedlings from high yielding mother trees (not ordinary seedlings), with bud-grafts.

MR. MAAS comes to different conclusions from DR. STEINMANN after analysing the results in very considerably wider fields of investigations. He

makes the very important statement :—

"It appears to me that with the bud-grafting material at present at our disposal, already an important production increase may be expected in comparison with unselected seedlings."

If this very plain statement by a scientist of high repute who has devoted years to the subject on which he writes is correct, and when one reads the details of practical results obtained already it is difficult to believe it possible that it is incorrect, then it will be folly to ignore all that it means to the rubber planting community, and to the country generally.

Again MR. MAAS says:—

"Illegitimate selected seedlings appear to me, up to the present, on an average not so good as bud-grafts."

(By illegitimate selected seed, he means seeds from selected high yielding trees).

Again :—

"In answer to the question' what shall we plant at present—bud-grafts or selected seeds?' (he seems to take it for granted one or the other must be planted) "I advise, for safety's sake, plant both bud-grafts and selected seedlings in alternate rows. . . . not less than 140 to 150 trees per acre, so that later on a proper thinning out will be possible."

IN JAVA AND SUMATRA.

In the Netherlands Indies it has been recognised for some time past that ordinary planting methods are out of date. Over there it seems to be realised that high yields can be obtained either by bud-grafting or by seed selection. There is some difference of opinion at present as to whether the more expensive bud-grafting will give so much better results than selected seeds as to justify the expenditure. In my humble opinion the weight of evidence now available distinctly shows that, though seed from selected trees may give much better results than was expected, bud-grafting gives even better than the seed results, though, of course, as everyone is now aware, with the material at present available, on an average nothing approaching the extravagant yields which were thought possible two or three years ago can be obtained.

I believe that the Netherlands Indies are right in apparently taking it as certain that old planting methods are out of date and that a substantial increase of yield over normal can be obtained by bud-grafting or else by seed from selected trees, or by a combination of both methods and at the same time close planting so as to give scope for rational thinning out of bad yielders.

There can be little doubt that after a considerable number of years of experimental and practical work this substantial increase now obtainable under present new methods will be very greatly improved later on. There is however no reason on this account why those who wish to plant now should not take full advantage of bud-grafting and seed selecting, as even with present day knowledge they will obtain properties of a very much higher value than by planting under the old ordinary conditions.

Dangers, such as that arising from the risk of Brown Bast, can already be shown to be avoidable to a practical extent.—MALAYAN TIN AND RUBBER JOURNAL, Vol. XII. No. 20.

TOBACCO.

THE CULTIVATION OF TOBACCOS IN CEYLON FOR THE EUROPEAN MARKET.

F. A. STOCKDALE, M.A., F.L.S.,

Director of Agriculture, Ceylon.

Experiments in tobacco cultivation have been carried out for a number of years, and the results of these experiments have been published from time to time.

Attention was first given to the Jaffna area, in view of the difficulties which were experienced by tobacco growers there with the Travancore market. A large number of varieties were experimented with, and attempts at flue-curing were undertaken. As the result of these experiments it was found that White Burley Tobacco of good quality and colour could be produced and that this product commanded a ready sale on the European markets. The burning qualities of this tobacco were not as satisfactory as could be hoped for, but the burning qualities of Jaffna-grown White Burley is not complained of. Generally, this type of tobacco is used for manufacture of pipe tobacco mixtures. The burning quality of all tobaccos grown at Jaffna are not good, and this has been ascertained to be due to an excess of chlorine in the leaf.

Having found that good crops of White Burley could be grown for the European market, endeavours were made by means of a purchase scheme to encourage tobacco cultivators to take up the cultivation of this type of tobacco. The results have been as follows:—

		Plants grown.	Value, Rs. c.
1920 ...	Two cultivators ...	... 1,095 ...	177 10
1921 ...	Seven cultivators	... 2,687 ...	466 80
1922 ...	Seven cultivators	... 4,611 ...	646 80

This progress has been slow, but this year there is increased keenness to take up the cultivation, and it is expected that fifty cultivators will grow White Burley this year and that they will grow some 33,000 plants.

The next experiments were carried out in the Dumbara Valley at Teldeniya, and subsequently at Nalanda Experiment Station. These trials consisted of a series of experiments with cigar and cigarette types, and the results obtained have been published for general information. Good acreage yields of different cigar types were secured, and the manufactured leaf was of fair burning quality. It was, however, heavy in body and of a slightly acrid flavour. The reports on the suitability of these tobaccos for the European market were not encouraging, and it was subsequently ascertained that only the Maryland Mammoth would be acceptable, and this at a price which would not be remunerative under Ceylon conditions.

During March, 1923, MESSRS. HURD of the Imperial Tobacco Company and PALETHORPE of the British-American Tobacco Company visited Ceylon and inspected samples of Ceylon-grown White Burley and of the different cigar types being grown at Nalanda. With the exception of some Maryland Mammoth no type of tobacco grown at Nalanda was considered to be of sufficiently good quality for the English market, and they strongly advised that trials should be made in this area with White Burley. They instanced the growth of the cultivation of White Burley in several parts of India, where several thousands of acres are now under this type of tobacco, and they stated that the demand for White Burley of good quality was steady.

They promised to send over a representative of the Indian Leaf Tobacco Development Co., and accordingly MR. ACREE visited Ceylon in August. He visited the Dumbara Valley and Matale tobacco-growing areas and went fully into the possibilities of flue-curing. He was convinced that the types of tobacco which gave the greatest promise for Ceylon conditions were the Burley types, and advised trials with White Burley grown from Ceylon seed, Indian seed, and American seed, and he also advocated small trials with Blue River Burley and Adcock tobaccos.

Arrangements have been made for these trials this season, and tobacco experiments on the line indicated above will be made at Jaffna, Nalanda, Ambalantota, and Bibile Experiment Stations.

MR. ACREE was emphatic on the necessity of making trials with White Burley on non-irrigated land, as the quality is invariably better than when grown under irrigation. He was also convinced that conditions in Ceylon were not favourable for flue-curing of tobacco, and he did not advocate further experiments in this direction.

THE CIGAR BEETLE.

W. V. TOWER.

There is a small insect known as the cigar beetle which does a tremendous amount of damage to harvested tobacco in Porto Rico as well as in other countries in both the tropical and temperate zones. This is nothing new but was known and described more than one hundred years ago. It is only of late years, however, that successful means have been found for destroying it.

This insect occurs in cured tobacco, doing considerable damage in the loose leaf, in the bales, and especially in cigars. While it consumes tobacco in all three conditions, it does the most harm to the cigars, because it cuts holes which, while only few in number, make it impossible for the cigar to be smoked. This insect is so widely distributed and the damage caused by it so great, that at this time it is a menace to the tobacco industry in Porto Rico. Not only are large amounts of tobacco consumed outright through the warehouses by this insect but thousands of manufactured cigars are returned to the manufacturer by the dealers because they have been damaged by the insects emerging from the cigars after they have been placed on sale with the retail trade.

The writer has spent three months of the present year fumigating warehouses and factories for the largest tobacco company operating in Porto Rico. All buildings where tobacco was stored as well as work rooms were fumigated; space to the extent of 4,700,000 cubic feet. This work was so successful that it is not probable that the buildings and the contents will be allowed to again become infested with this insect.

The losses occurring in stored tobacco of whatever form are so great and the methods of fumigation so cheap that every producer or dealer in tobacco should arrange to have the work done. Of the many different methods tried during the last hundred years, fumigation with hydrocyanic acid gas has proven the most successful as well as, under our conditions, cheapest. However, this method is very dangerous as the gas evolved is fatal to any organism that breathes and the gas is very quick and deadly in its action. If the tobacco owner wishes to undertake the fumigation it should be done only under the direction of an expert in the beginning and until the method is thoroughly learned and all points carefully considered by whoever is to continue the work. The Station will undertake to advise any one who desires to carry out this work in Porto Rico.

DIFFERENT METHODS OF CURING TOBACCO IN SOUTH AFRICA.

J. DU P. OOSTHUIZEN,

Manager, Experiment Station, Rustenberg, (in Journal of the Department of Agriculture, Union of South Africa, Vol. V, No. 2.)

The rapid increase in the world's consumption of cigarettes has led to a corresponding increase in tobacco leaf production in South Africa (in 1921 approximately 18,000,000 lb. weight of leaf) a large proportion, however, consisting of inferior or low grade leaf tobacco due to lack of regular methods in growing, curing and handling the crop. The light type of tobacco offers the best market to the grower, but even under favourable conditions of soil and climate, the present methods of curing, render the crop unfit for cigarette manufacture.

With a view to assisting growers to remedy this defect and also to improve the quality of their tobacco generally, the author has explained in detail the various changes that take place in the leaf in the curing process, and the results obtained with the different methods. The control of the two chief factors heat and moisture is responsible for the resulting quality of the leaf. A full description is given of the four methods of curing viz.: air; flue; sun, and fire-curing. As regards flue cured tobacco a one week's record is given of the exact temperature maintained, moisture regulations, etc.

The importance of careful handling after curing up to the time of sale is accentuated. Details are given as to the correct method of conditioning, grading, stacking, baling and transport.—INTERNATIONAL REVIEW OF SCI. AND PRAC. OF AGRIC., VOL. I, NO. 1.

COTTON.

COTTON GROWING IN HAMBANTOTA DISTRICT.

F. BURNETT,

Divisional Agricultural Officer, Southern.

My remarks on cotton growing in the Hambantota District will be confined to a brief survey of cotton growing by the villagers in that district. As a result of the experiments conducted at the Ambalantota Cotton Experimental Station, there has been a steady growing demand for cotton seed by small holders in that district; and in 1923 the following scheme was mooted to encourage cotton growing by the peasants in one-acre plots. The scheme was that every cultivator applying for two acres of chena land (this being the usual acreage given out to cultivators for chena cultivation in that district) would also be given the option of taking a lease of 3 acres in all, on condition that one acre was planted with cotton, the extra one acre being leased for cotton at one rupee. These suggestions were approved, and on March 29th a meeting of the Food Production Committee, Hambantota, was convened in order to discuss further details of the scheme. Questions that had to be settled were :—

(1) Variety of cotton to be grown.
(2) Appointment of an Agricultural Officer to supervise and instruct all cultivators.
(3) Amount of seed wanted, supply and payment for same.
(4) Fixing of main and minor collecting centres.
(5) Obtaining a guaranteed price for the 1925 crop.

As a result of the meeting referred to, propaganda work was started, and leaflets issued, showing results that had been achieved at the Experimental Station. The Chief Headmen were enthusiastic, as they knew the results that could be obtained by growing small plots. By the end of May the following number of applicants for land for cotton had been received and the rent for same deposited :—

	Acres.
Paranagam palata	426
Walgam palata	231
Ihala Walakada palata	294
Pahala Walakada palata	179
Modaragam palata	101

Making a total of 1,231 acres in East Giruwa pattu alone. There were also 217 applicants from Magam pattu and 102 applicants from West Giruwa pattu. A grand total of 1,649 acres.

The large number of applicants from East Giruwa pattu has been due to MUDALIYAR WIJETUNGA who has worked very enthusiastically to popularize this new industry.

The supply of seed caused a little anxiety, as it was desirable to supply the cultivators with a long staple variety to enable them to fetch as high a price as possible on the market. Durango was recommended, but sufficient seed of this was unobtainable. The Director of Agriculture, however, secured an adequate supply of a long-staple American Upland variety from South Africa, and the consignment of seed arrived at Hambantota on September 29th, in time for planting with the break of the north-east monsoon. The seed was packeted in 6 and 7 lb. packets, and delivered to various distributing centres and to the cultivators by means of double carts, in co-operation with the headmen. It was found that the small holder was unable to pay for the seed at the time of delivery and payment for the seed at a reduced rate has been deferred until harvest.

Unfortunately this year the continuous rains have interfered with the burning of the chenas, and this will militate against such a successful year as was at first anticipated. However, where it has been found impossible to burn, permission has been given to the small holder to cultivate last year's chenas, and in spite of the rain a considerable acreage will be planted up. I have recently seen plots with the seedlings first coming through and planted in a systematic manner. Some of the cultivators have already experienced some of the troubles previously encountered at the Experimental Station. Field rats and mice have destroyed some seed, and where this has happened re-seeding has been necessary.

Last year the cotton grown by small holders was bought by the Agricultural Department direct at a guaranteed price and afterwards sold to the Weaving and Spinning Mills, Colombo. This year owing to a much larger area being planted, other arrangements will be necessary, and further details of buying the crop will be worked out after an estimate has been made later on of the yield to be expected.

NEED FOR FRESH COTTON FIELDS.

An instructive lecture was delivered at the Textile Institute, Manchester, by MR. WALTER R. DUNLOP, Professor of Economics at the West Indian Agricultural College, on "Cotton and some of its Problems." MR. MYERS, Chairman of the Lancashire Section of the Institute, occupied the chair.

The lecturer, in giving a brief history of the cotton supply in this country, said the enormous industry of this country and the world was essentially a nineteenth century development, extending from the French Revolution in 1798 to the outbreak of the European War in 1914. Up to the French Revolution France was the coming cotton country, but the Revolution brought as its material penalty a set-back to French industrialism, which took at least ten years to recover. Britain diverted the supply of cotton to this country.

Regarding the present position of world production and consumption, PROFESSOR DUNLOP said that during the last 25 years the consumption had been increasing at a greater rate than production. It was due to the

increasing manufacturing demand of the United States, Canada, Japan and India, and to a reduction in the acreage yield in America and Egypt. The decrease in Egypt per feddan had been due to poorer lands being brought under cultivation, bad drainage, and insect pests like the pink boll-worm, the latter being the main factor. In the United States during the last ten years it was due to the spread of the boll-weevil and labour shortage. In new areas the pink boll-worm was the most serious insect pest. The boll-weevil was confined entirely to America, whereas the pink boll-worm was world-wide in its distribution.

Discussing the United States crop, the lecturer said that perhaps the most serious feature was the tendency to violent fluctuations due to the reaction of prices on area planted, the weather damage during prolonged picking periods, and the notoriously speculative character of the crop. Mixed farming also made regulation of the cotton area economically easy, while high labour costs did not make it attractive or even possible at pre-war prices. Furthermore, conditions in the United States were not conducive to the preservation of uniformity and of quality—a very important matter for Lancashire. There had been deterioration in quality as well as quantity due to longer picking periods, inefficient baling and compressing, and insect pests. To indicate the immediate position, in the season 1921-22 the world's crop was 15 million bales and the world's consumption nearly 21¼ million bales, of which nearly 13 million bales was consumed in the United States. This implied the absorption of the carry-over, or post-seasonal stock, and was obviously serious. The position at present was that trade would not revive sufficiently to make the supply of cotton a serious matter for some years. The present need for expanding and stabilizing the production of cotton in the near future was obvious, and it was a matter the urgency of which had long been recognized. The work of the British Cotton Growing Association had led to excellent results, and it was also being taken up by the Empire Cotton Growing Corporation with the assistance of the spinners, and they would by means of the Corporation be able to provide more scientifically trained men in new areas. The Sudan, India, East and West Africa and Queensland were being given increasing opportunites to expand.

The department with which he had been connected in the West Indies had tried to re-establish Sea Island cotton round about 1897, and it took many years, with great difficulty and perseverance, before that industry could be properly established. Now, through lack of demand for finer cottons, the existence of the industry was jeopardized. They had to be very careful or it might deteriorate, and possibly disappear.

The expansion of cotton into new regions of the empire was no easy task. This was a matter which might not interest them directly, but he thought it was extremely advisable for people in Lancashire to be familiar with what was happening and what they were trying to do at the production end. It was evident in regard to these problems the difficulties which would arise were temperature, water, labour supply, transport and finance. It was to be hoped that no scheme would be attempted unless these matters were present and could be provided for. They were obviously essential in these regions and demanded the employment of men of ability.

In regard to pests in new areas, from the standpoint of American production the boll-weevil was by far the most serious pest; but it was the pink boll-worm which was the most menacing pest in new areas. The distribution of the pink boll-worm gave cause for considerable anxiety, but the boll-weevil was entirely confined to the United States and tropical America, whereas the pink boll-worm had a world distribution, which was an important point in regard to sending cotton into new areas.

The development of cotton in new areas required a study of human nature, economic subjects in general, as well as a study of natural scientific conditions. Cotton was grown by coloured labour largely. At present, as MR. HIMBURY showed, cotton cultivation was between 17 degrees north of the equator and 15 degrees south, and the production of cotton would not only be largely dependent on coloured labour but also on coloured management. All this meant that scientific organization and study of man in relation to cotton would be as necessary as the study of cotton in relation to man.

In developing the empire's cotton fields in the future it would be necessary to have economic research. By economic research he meant investigation into the problems and difficulties along lines that came under the studies of the various schools of economics and conducted along practical lines, and accurate costing would be necessary. The study of marketing was very important in other forms of raw material. He was advocating industrializing cotton, to put it on the same organized scale as the intermediate manufacturing industries through which the raw material went before it reached the consumer in the form of goods. It required broad thinking. From the spinner, even from the consumer, to the cotton grower there must be one continuous line of organized contact—a cotton industry to embrace production, manufacture, and distribution. Research and ingenuity in this country must be unremittingly applied to keep up and extend the demand.

At the growers' end psycho-economic science, as well as natural science would be wanted. The conception of tropical labour as a herd of human energy to be exploited was archaic. A feature of cotton growing was that it was increasingly becoming the occupation of the smaller peasant proprietors. In any case, even with ordinary wage earners, motion studies, reduction of fatigue and possibly vocational selection were necessary. The object was to save time, reduce fatigue, strengthen efficiency and lessen the cost of production. These were only some of the possible applications of psycho-economics. One could mention further the statistical (mathematical) study of the cost of living, market prices of cotton and production costs in different countries and the complex and important problems of price reactions on production in different areas. Accurate costing was essential, especially when there was rotation of crops, and systematised methods should be introduced in order to avoid, for instance, the inclusion of interest on capital as a costing charge as had been done recently in Texas. Accurate costing could be done. It had been done by the rubber industry, which produced perhaps the best costing figures of any industry growing raw material in tropical countries. On the other hand, in certain districts where cotton was grown in rotation with other crops, he did not think any one really knew the cost of its production.

But in the long run the ultimate success of establishing new and large areas would depend upon a rational combination of interests. There ought to be closer economic contact between the manufacturing and the producing end. If the new areas were to be established, it was up to manufacturers, spinners and even consumers to do what they could to stabilize prices and stimulate the demand, especially for the finer kinds. A good example of the tendency to organize an industry right through from the production of the raw material to the manufacturing was seen in connection with rubber. Something like the general organization that was there being attempted should be done in relation to cotton. If some of the lines of development he had suggested were followed, by the end of the twentieth century the supply of cotton would be satisfactory, and the industry as a whole would be not merely one of the greatest imperial industries but one of the greatest imperial achievements.—AGRIC. JOURN. OF INDIA, Vol. XVIII. No. VI.

PADDY.

PADDY CULTIVATION.

W. MOLEGODA,
Agricultural Instructor.

SELECTION OF SEED.

One of the reasons why we get low yields for our paddy is because our cultivators do not take the trouble to get the best seed. The paddy cultivator in Ceylon is reputed to be careful about his seed paddy but his care does not extend beyond securing seed that gives a good percentage of germination. He does not care if the seed is mixed with another or several strains of paddy; he does not care if it is the produce of a weak plant; all he wants to be sure about is that the seed is from a matured crop that did not get wet at harvest. His test of good seed is to germinate a handful and see how it germinates.

During the last few years a persistent effort has been made to educate the paddy cultivator to select his seed paddy and the results already produced in certain areas are satisfactory. Numerous instances can be quoted where trials with selected seed have yielded marked increases of crops. The ordinary cultivator when he sees the methods adopted in making the selection complains that it involves unnecessary labour but the more intelligent and careful cultivators have almost always followed the methods adopted, as stated before, with good results. The methods so far followed have been simple and can easily be understood and practised by all paddy cultivators. It may be that this system adopted in the selection of seed can be considerably improved but any elaborate methods involving great trouble and scientific knowledge were deliberately avoided for good reasons so far.

The accompanying photograph shows the actual selection of seed paddy conducted in the company of cultivators and for their benefit. The methods followed may be summarised as follows:—

(1) The area of operation was visited during the latter part of the growth of plants and plants above the ordinary were noted.

(2) When the crop was about to ripen the better plants were noted and marked.

(3) Just before harvest the best of these plants were selected and the best ear-heads were harvested for seed.

The following points were taken into consideration in noting the plants.

(a) Healthy growth.

(b) Number of tillers of uniform growth bearing ear-heads true to type of the variety cultivated.

(c) Similarity of ear-heads and uniformity of the stage of ripeness.

SELECTING SEED PADDY

However good the tillering capacity, however long and heavy the ear-heads were, weak plants that had gone flat were rejected as also those plants that had tillered heavily but contained a proportional number of stalks without ear-heads. For example a plant with 10 tillers bearing 8 ear-heads was preferred to a plant with 18 tillers and only 10 ear-heads.

Before gathering, the ear-heads were examined and although long and well packed the ears were, if they did not contain well filled and well developed grains true to type, such ear-heads were passed over.

These were roughly the lines of selection adopted and in some cases the use of seed selected in this manner give results that compared very favourably, as for instance (1) In Mavilmada a field ½ acre in extent gave 28 bushels as compared with 22 bushels with village seed ; (2) in Yatiwawala a field about ¾ acre gave 40 bushels as compared with a field of the same sowing extent which gave little over 34 bushels ; (3) in Dunuwile the increase of yields have been from 15-25% ; (4) in Kondedeniya last Maha season several plots were sown with seed selected in this manner by the cultivators themselves and everyone of them expressed their satisfaction at the results. (5) The field attached to the School of Tropical Agriculture has been planted during the last three years with Hatiel selected by me. The percentage of germination here has been over 95% and the quality of the seedlings so good that the seed rate was very considerably reduced. In the villages where seed selected in this manner is used the seed rate is being gradually reduced and where two bushels were used before for raising seedlings to plant an acre the rate has been reduced by 50% and possibly as time goes on this quantity will be reduced still more.

During the last Maha season most of the paddy in Harispattu as well as in other parts of the district was "laid down" by the rains and much loss caused thereby, but the fields growing selected seed were not so badly affected. That conclusively proved to the cultivator that the use of good seed was beneficial in more than one respect.

A number of cultivators were made to select seed last season and that paddy is now growing on their fields. Further selections will be continued during the present Maha season more extensively and I expect by a much larger number of cultivators.

To those intending to adopt this simple method of seed selection the following hints may be useful.

1. Always select the ear-heads from the standing crop. If once harvested it will be difficult to say whether the particular ear is from the plants noted.

2. Always aim at strong plants with a number of well developed ear-heads.

3. Reject all plants bearing any discoloured or diseased grains.

4. Pass over all plants that have fallen flat.

5. At the first noting of the plants mark them for identification. At the second examination mark them for selection. At the final selection reject all bad selections.

6. Harvest the selected plants separately and thrash the paddy carefully. Dry the seed well in the sun and store away preferably in an earthen vessel.

OILS.

NOTES ON CASTOR SEED, CULTIVATION, ETC.

COMPILED BY THE DEPARTMENT OF AGRICULTURE, KENYA COLONY.

Climatic.—Castor (*Ricinus communis*) is sensitive to frost and is therefore only adapted to warm climates or to countries where the summers are sufficiently long to mature the seeds. As a rough guide it may be regarded that where maize can be successfully grown castor will succeed.

Rainfall.—The plant requires a fair amount of moisture and rainfall after sowing is essential to ensure good germination. In some districts its cultivation appears to be restricted by excessive rainfall.

Soil.—The soil best suited for the cultivation of castor is a rich, well-drained sandy or clayey loam, or any land that produces good wheat and maize ; loose sandy soils and heavy clay should be avoided.

Effect on Soil.—The castor plant soon exhausts the soil and consequently manures are necessary to keep up the supply of available nitrogen, potash and phosphoric acid. A valuable manure for this purpose is the residual cake left after the expression of oil from the seed. The empty capsules, shells, leaves and stems of the plant should also be returned to the soil. Pure crops of castor should not be taken from the same land more than once in 5 or 6 years.

Varieties.—Numerous varieties both indigenous and imported are at present existent in the Colony. No data indicating the best varieties to plant are at present available. These matters can be governed only by local conditions and experience.

Treatment of Seed.—Before sowing it is advisable to pour warm water over the seeds and to allow them to steep, without further heating, for 24 hours.

Spacement. (1) *Large Seeded Varieties* should be sown in rows 5 to 6 feet apart and at a similar distance in the rows.

(2) *The Small Seeded Varieties* may be planted 3 feet between the rows and 18 inches from plant to plant.

Sowing.—In order to obtain a regular stand it is advisable to place 3 or 4 seeds 6 inches apart in each little mound along the rows, or they may be dropped in the furrow made by the plough and covered by the following plough, dibbled in by hand.

Thinning.—When the seedlings are 6 to 8 in. high they should be thinned out and only the most vigorous specimen in each group left to develop.

Quantity of Seed Per Acre.—About 10 lb. of the large seeded varieties and 14 lb. of the small seeded are required to plant an acre.

Cultivating.—It is advisable to slightly mould up the plants by drawing the soil up around the stems to prevent moisture collecting at the base. Until the plants attain a height of 2 feet hoeing or ploughing should be practised to keep down weeds and conserve soil moisture.

Pruning.—If plants grow too vigorously and long shoots are consequently produced the latter should be topped, and retained at a height of 6 to 8 feet thereby promoting branching, the formation of more flowers and increased crop of seeds. The seeds are also easier to collect from dwarf plants than from tall specimens.

Period from Sowing to Harvesting.—Large seeded varieties ripen according to climatic conditions in from 7 to 10 months from time of sowing. Small seeded varieties from 4 to 5 months.

Appearance when Ripening.—When ripe the seed capsules become hard and brown and spread out somewhat on the stalk on which they are borne.

Harvesting.—As soon as the capsules shew signs of ripening the spikes should be cut from the plant, this should be done rapidly because if left too long on the plant they frequently dehisce and scatter the seed. When the collecting has once commenced the whole crop requires to be looked over at least once a week. Harvesting is a tedious process but not laborious and can be undertaken by women and children.

Drying.—The capsules should be conveyed to a drying shed or barn; where buildings are not available a drying floor in the open may be made by sweeping clean a piece of dry firm level ground enclosing it with boards or sheet iron 4 feet to 6 feet high to prevent the seeds being scattered when the capsules dehisce. If the latter course is adopted provision against rain should be provided. The capsules should be spread on the floor, exposed to the sun and air and occasionally turned over. In less than a week most of them will have burst and shed their seed. If the capsules appear disinclined to open, beating them may be resorted to. Another method is to pass a wooden roller drawn by a pony whose hoofs are protected by padding, over them.

Another method employed in some parts of India is to stack the capsules in heaps in a building. They are then covered with straw and weighted. After about a week the outer husk is soft and rotten. They are then exposed to the sun and beaten to free the seeds.

Collection and Cleaning the Seed.—After the seeds have been separated from the capsules the empty husks should be removed and the seeds swept together and collected. The pieces of husk and other debris with which they are mixed may be removed by winnowing either by hand or by passing the seeds through a fanning machine.

Storing.—The seed should be stored in a dry place until pressed or packed for export

Yield.—In India. When grown as a pure crop the yield per acre is from 300 lb. to 900 lb. The yield of individual plants grown together as a single crop is much less than that of well developed freely branched plants that have been grown singly, as much as 20 lb. of seed per plant has been collected from those.

In the United States on suitable soil and with good cultivation 900 to 3,150 lb. per acre have been harvested.

In Brazil it is calculated that in the castor plantations each plant yields from 4·5 to 11·25 lb. of seed.

Diseases.—No reports of disease seriously affecting castor plants have been received. It should be noted, however, that some varieties (particularly imported varieties) are susceptible to rust.

Insect Pests.—Castor plants are subject to attack by the Goat Moth 'Borer.' This pest is not regarded as being of a serious nature if castor is planted as an annual crop.

Caterpillar of Brown Tail Moth feeds on the leaves but unless in great numbers are not responsible for much loss of foliage.

Oil Content.—The percentage of Oil in Indian seed ranges from 41·1 to 48·7%.

A sample of castor seed grown at Njoro was examined by the Acting Director of Chemical Research in September 1923 and found to contain 51·6% of oil. A sample grown at Nakuru and sent to London in September 1923 contained 50·90% of oil, but in this instance the free fatty acid in the oil was very high namely 3·91% instead of nearer the average of 2%.

World's Supply and Demand.—The main source of production is India. During 1922 the exports from India were :—

To United Kingdom	18,627	tons
,, Belgium	8,266	,,
,, France	15,949	,,
,, Italy	7,585	,,
,, United States of America ...	32,324	,,
,, Other countries	2,724	,,
Total	85,475	tons

A considerable quantity is produced in Brazil but no information as to the actual quantities exported therefrom is available.

Exports : Castor Seeds exported from Mombasa.—

1913-14		1914		1919-1920		1921		1922	
Quantity,	value.	Quantity	value			Quantity	value.		
162 cwt.	£168	162 cwt.	£59	Nil.	Nil.	1,205 cwt.	£675	Nil.	

Recent Prices.—Bombay, (24th August, 1923) £16 6*s.* 8*d.* per ton, f.o.b., f. a. q.

LONDON, (2nd August, 1923) £19 10*s.* per ton, c. i. f.

Expression of Oil.—Castor seed should be pressed twice, the first pressing can be done without heating the meal so that an oil of high quality is obtained. The cakes would be stored until a quantity has accumulated, they would then be passed through the reducer, crushed, heated and pressed a second time. The cakes when pressed once only will contain about 12% of oil ; with double pressing this should be reduced to about 8%. As castor seed cake cannot be used for cattle feeding but only as a fuel or fertilizer, the utmost yield of oil should be obtained and therefore double pressing is advised.

Cost of Machinery.—An Oil Mill with a capacity of 1½ cwt. per hour with special grooved rollers suitable for castor seed can be purchased for £750 f.o.b., United Kingdom ports. This is a complete plant for the purpose, exclusive of driving engine. The shipping weight of the plant is approximately 5 tons.

Uses of castor seed.—

(1) Medicinally, as a purgative (Oil),
(2) Lubricant (Oil)
(3) Illuminant (Oil)
(4) Leather dressing (Oil)
(5) Preparation of "Turkey Red" Dye (Oil)
(6) Preparation of Rubber substitutes (Oil)
(7) Manufacture of Soap (Oil)
(8) Preparation of "Cognac" (Oil)
(9) Castor Seed Cake
(10) ,, ,, Meal } as manure, etc., etc., etc.

Castor Trees for Sericulture.—The castor leaves are the food of the Eri Silk Moth. The leaves are picked and fed to the caterpillars on trays in huts or wattle and daub bandas. The deprivation of leaves does not materially affect the volume of the seed crop.—FARMERS' JOURNAL, Vol. 5, No. 43.

CATTLE FOOD.

SOME NOTES ON RECENT EXPERIMENTAL WORK ON THE VALUE OF COCONUT CAKE AS A FEEDING STUFF.

A. W. R. JOACHIM, B.Sc. (LONDON), A.I.C., DIP. AGRIC. (CANTAB.)
Office Assistant, Dept. of Agriculture, Ceylon.

Coconut cake, or '*poonac*' as it is commonly known in Ceylon, has been widely used as a feed to dairy cows and to some extent to other farm animals in all countries where the coconut industry flourishes—California, the Philippines, Ceylon, etc. Of recent years it has been fairly extensively used in Europe and as its use is likely to increase it would be well to write a short note on the value of this oil meal in feeding cattle and farm animals generally. When fed to dairy cows, coconut meal tends to produce milk which gives a hard butter of excellent flavour. It can thus be combined with other cakes e.g., linseed cake, that have the opposite effect. As a food for pigs its value lies in the fact that the pork obtained is firm and of a good quality. Coconut meal is also used for feeding poultry and horses. For the latter it is used either mixed with oats, or as a substitute for it, the effect of the mixture being more pronounced than when oats alone are used.

The cake was reported (a) to have a beneficial influence on the milk secretion of cows, increasing the fat content of the milk and (b) retarding the natural decrease in milk yield due to advancing lactation. This was recently tested at California by F. W. WOLL and the results obtained confirm the statement made. To test the truth of (a) "twenty-four cows were selected for the experiment, and were separated into three lots as nearly uniform as possible as to breeding, age, body weight and production of milk and butter fat. The experiment was divided into two periods of six weeks each." After uniform preliminary feeding the two lots were rationed as follows:—

PERIOD I.

Lot A. Regular grain mixture.
Lot B. Regular grain mixture + 2 lb. coconut meal per head daily.
Lot C. Regular grain mixture + 4 lb. do do do.

PERIOD II.

Lot A. Regular grain mixture.
Lot B. do do + 4 lb. coconut meal per head daily.
Lot C. do do + 2 lb. do do do.

"All conditions surrounding the cows were made as uniform as possible. The milk of the individual cows was weighed at each milking, and samples tested for butter fat and solids once a week. The results show that the production of butter fat due to the feeding of 2 lb. coconut meal was 3·9% higher than that of the check lot and that obtained when 4 lb. of meal were fed only ·8% higher than of the check lot. The average milk yield too was somewhat higher for the lots fed with the 2 lb. coconut meal than for the check lot and a corresponding decrease occurred when 4 lb. coconut meal were fed" This shows that light feeding with coconut meal is greatly beneficial to dairy cows.

The experiment to demonstrate (b) was conducted thus. Rations of coconut meal and coconut meal mixed with grain were given to two lots of

twelve cows each, the feeding being carried on as follows:—

LOT A.

Period I Regular grain mixture
Period II. Grain mixture + coconut meal

LOT B.

Period I. Grain mixture + coconut meal
Period II. Regular grain mixture only

The results prove that the rations of coconut meal and mixed grain feeds are not only equal, but somewhat superior to the standard mixtures for milk production.

In view of the foregoing statements and experimental results obtained and the fact that coconut meal is the chief concentrated foodstuff used for dairy cattle in Ceylon, an account of the origin, chemical composition, and nutritive value of this meal will be of use.

Origin :—As is well-known, coconut cake is obtained as a bye-product in the manufacture of coconut oil from 'copra'. The percentage of oil in the copra varies from 30 to 50 of the dried product according to the degree of maturity of the nuts. Two methods are usually adopted for its extraction (1) by pressure and (2) by the use of solvents.

The residue is usually obtained in the form of slabs or cakes about $\frac{3}{4}$ inch thick. These are usually ground down into '*meal*' or broken into small pieces. In Ceylon '*poonac*' is classified as '*chekku*' and '*mill*' poonac—the former being extracted by the native mill or '*chekku*' and the latter by the hydraulic press. As a rule the *chekku* mill poonac contains more oil than mill poonac, and is therefore of a higher feeding value than the latter.

Chemical Composition.—Analyses of numerous samples of both kind of 'poonac' were made by COCHRAN and the results are given below.

TABLE I.

	Mill	*Chekku*
Moisture	11·7 %	12·4 %
Oil or Fat	11·6 ,,	15·0 ,,
Proteins (Albumenoids) ...	19·0 ,,	18·0 ,,
Carbo-hydrates	43·2 ,,	41·0 ,,
Woody Fibre	6·0 ,,	5·6 ,,
Ash	8·5 ,,	8·5 ,,
	100·0	100·0
Nutritive Ratio ...	1:3·75	1:4·36
Nutritive Value ...	91·2	96·5

More morden analyses made by WOLL of the Agricultural Experimental Station, California, on the Californian varieties of the meal gave the following average results :—

TABLE II.

	Average	*Ranges*
Moisture ...	10·55 %	6·9—15·7
Protein ...	20·69 ,,	18·5—22·4
Fat ..	8·78 ,,	6·5—10·7
Fibre ...	9·60 ,,	5·7—14·7
Carbo-hydrates, etc. ...	44·41 ,,	39·6—49·5
Ash ...	5·97 ,,	5·1— 7·0
	100	100

It will be seen from the above analyses that the composition of the meal varies considerably according to the quality of the raw material and the method of manufacture especially with reference to the extent to which the oil is removed in the manufacturing process.

The average compositions and digestibilities of the most important concentrated Feeding Stuffs and the costs of same per cwt. are appended for comparison.

TABLE III.

	Cost per cwt.	Proteins	Fat	Fibre	Carbo-hydrate	*Digestible* Protein	*Digestible* Carbo-hydrate
Cotton-seed Meal	—	40·5	8·5	9·9	27·0	35·6	39·8
Linseed meal (old prices	Rs.	33·9	7·8	7·3	35 9	30·2	47·5
Linseed meal (new	11	37·5	2·9	8·9	36·4	31·5	41·1
Ground Barley	9·50	12·0	1·8	4·2	68·7	9·4	75·9
Groundnut meal	7·50	47·6	8·0	5·1	23·7	42·9	38·3
Coconut meal	7·00	19·5	10·4	9·5	42·1	16·4	64·2

Feeding Value and Costs.—Tables II & III show that the protein, fat and ash contents of the meal are comparatively high. It is thus of high feeding value to stock and especially to dairy cattle. It differs from the Linseed and Cotton seed meal in that it contains considerably less protein or flesh-forming material, but more fat. Its high protein content makes it a valuable component to be compounded with starchy foods like cereal grains or medium protein feeds like wheat bran.

With regard to the digestibility, coconut meal is seen to have in comparison with other meals a very high digestibility.

The digestibility of coconut meal was determined by several investigators in experiments with sheep, cattle and pigs. The results obtained are as follows :—

		Range	*Average*
Dry	...	75— 90	82 %
Crude protein	...	75— 90	85 ,,
Fat	...	96—100	98 ,,
Fibre	...	23— 73	50 ,,
Carbo-hydrates	...	80— 87	83 ,,

TABLE IV.

The *Nutritive Ratio* by which term is meant the ratio of (% digestible carbo-hydrates + 2·25 × % digestible fats) to the % of digestible protein is about 3·5: 1. This, while being closer to that of wheat bran is under than that of the nitrogenous meals, e.g., cotton seed meal which has a nutritive ratio of 1·12: 1. Coconut meal therefore is essentially one that has to be fed along with starchy foods if anything like the normal nutritive ratio 5·1 for ordinary dairy cattle is to be obtained.

In more recent years ARMSBY in America has adopted the method of "*Net Energy Values*" to compare the nutritive value of different feeding stuffs. This figure expresses our nearest correct estimate of the feeding value of a foodstuff. His figures for the concentrated meals are as follows:—

		Nett Energy Value.
Cotton seed meal	...	90·0
Ground Barley	...	89·9
Linseed meal	...	88·9
Coconut meal	...	83·5
Wheat Bran	...	53·0

It is obvious therefore that coconut meal approaches very nearly to Linseed meal and Ground Barley in nutritive value; but as these feeds are much more expensive than the former, the extensive use of the latter mixed in suitable proportions with other feeding stuffs, is more than justified.

If the "*Food Unit*" is taken as the basis of valuation, this comparative cheapness of coconut meal is clearly demonstrated. The usual method adopted in practice for determining the number of food units contained in a feeding stuff, is by expressing the total nutritive constituents in terms of soluble carbo-hydrates. Fat and protein being roughly two and half times as valuable as soluble carbo-hydrate (the protein being a flesh former besides supplying energy, and the fat giving out 2·3 times as much heat as carbo-hydrate), the % of these constituents in the food stuff is multiplied by 2·5. The number of food units in coconut cake is thus, the figures being taken from Table III,

$$42{\cdot}1 + 2{\cdot}5\ (10{\cdot}4 + 19{\cdot}5) = 116{\cdot}85 \text{ food units}$$

in linseed cake $36{\cdot}4 + 2{\cdot}5\ (\ 2{\cdot}9 + 37{\cdot}5) = 137{\cdot}4$ food units

The cost of coconut cake being, according to the present market rates, Rs. 7/ a cwt. and that of linseed cake Rs. 11/-, the price of one food unit of coconut cake is 700/116·85 cents or 6 cents, and of linseed cake 1100/137·4 cents or 8 cents. It is evident therefore that a unit of coconut cake is cheaper than that of linseed cake, and hence the greater reason for a judicious extension of its use as a feed to dairy cattle and other farm animals.

There are some objections though to the extended use of this cake. Coconut 'poonac' is supposed to become rancid with keeping and hence unpalatable. This is due to an increase in the free fatty acid present in the cake, the amount in an average sample being about 1 %.

If care be taken the meal can be kept well for about two months, dampness, a high temperature, etc., being factors detrimental to the keeping quality of the cake. The keeping power of the cake will also depend on its method of preparation, the greater fat-containing samples being more difficult to preserve in good condition.

There is another objection to the more widespread use of this cake, and that is the disinclination of stock more particularly pigs and horses, to eat it at first This difficulty can be overcome by feeding only small quantities of the cake at the start, and that of the best quality. Fresh cake has usually an aromatic, nutty flavour, and when mixed with other foods is very palatable, and will be appreciated by the farm animals. The same thing applies to some dairy cattle as well. Later on however a relish for the cake is developed. In no case should more than two or three pounds per day be given, for, as the experimental results at California show, while a light ration of the cake has a very beneficial effect, a heavy ration has just the very opposite effect.

There are thus great possibilities for the future of coconut cake. This will of course depend on the quality of the cake manufactured. In Ceylon greater care should be taken in its preparation, and especially in the preparation of "poonac" for export. Experimental work too should be done to test its nutritive value in Ceylon cattle. There are opportunities for gentlemen farmers in Ceylon, who go in for cattle breeding, to conduct experiments of a similar nature to those dealt with, and thereby to establish on a firm basis the great value of this feeding stuff in animal nutrition.

CEYLON AGRICULTURE.

BOARD OF AGRICULTURE.

Minutes of a Meeting of the Board of Agriculture held at the Legislative Council Chamber, at 12 noon on Wednesday, November 21st, 1923.

HIS EXCELLENCY THE GOVERNOR presided.

Present.—The Hon. Mr. F. A. Stockdale, Director of Agriculture; the Hon. Mr. W. L. Kindersley, Government Agent, Central Province, Kandy; Sir Solomon Dias Bandaranaike; the Hon. Sir Marcus Fernando; the Hon. Mr. H. L. De Mel; the Hon. Mr. T. B. Panabokke; Dr. W. A. de Silva, Dr. C. A. Hewavitarne; Mr. C. W. Bibile, R.M., Mudaliyar V. M. Muttucumaru; Mudaliyar G. A. Goonetilleke; Messrs. T. A. de Mel; J. E. P. Rajapakse; C. Drieberg; Graham Panditteseker a; E. C. Villiers; A. Sabapathy; Allen Coombe; Ed. W. Keith; T. Waloopillai; A. P. Waldock; D. S. Senanayake; C. E. A. Dias; L. H. S. Peiris; K. Bandara-Beddewela; Gate Mudaliyar C. H. A. Samarakkody; Gate Mudaliyar L. A. Dassenaike; Mr. Albert A. Wickremasinghe; Gate Mudaliyar A. E Rajapakse; Mudaliyar E. F. Edirisinghe; Messrs. G. G. Auchinleck, R. O. Illiffe; F. P. Jepson, G. Harbord; F. Burnett, G. E. J. Hulugalle; W. R. Jacks; A. M. C. Dias; and A. W. R. Joachim (Secretary).

Visitors.—Hon. R. Trefusis, Private Secretary to His Excellency the Governor: Messrs. T. H. Holland and N. Wickremaratne.

Letters or telegrams expressing inability to be present were received from:—The Hon. the Controller of Revenue; Hon. Lieut.-Col T. Y. Wright; Col. T. G. Jayawardena; Messrs. R. G. Coombe; L. A. Wright; S. Muttutamby; S. R. Hamer and A. J. Austin Dickson.

The minutes of the previous meeting held on October 9th, 1922, were taken as read and confirmed.

The HON. MR. STOCKDALE said that before proceeding with the Agenda he would refer to the death of the Hon. MR. O. C. TILLEKERATNE, which had taken place since the last meeting of the Board. He moved that the Board do pass a vote of condolence on his death, expressing their deep regret to his widow and family. This was seconded by SIR MARCUS FERNANDO.

HIS EXCELLENCY THE GOVERNOR referred to the work done by the deceased to the country generally, and as a member of the Board. He put the motion to the meeting, which was passed in the usual manner, all standing.

Agenda Item No. 2. The Adulteration of Citronella Oil.

In the absence of MR. BAMBER, the Director of Agriculture added some remarks to the paper on the subject, which had already been circulated among the members. Citronella oil, he said, had for a long time been adulterated with 5% Kerosene. Recently however alcohol had been employed and to a very considerable extent. He had made careful enquiries on the matter. It was not the producer but the middleman who was to

be blamed for the adulteration. MR. BAMBER had suggested that there were two possible methods by which they could prevent adulteration—either by having Government inspection and test of the oils, or by asking the exporters to protect themselves by having their oils analysed before export. It was for the meeting to decide which of these alternatives was to be adopted.

The HON. SIR MARCUS FERNANDO made a few remarks on the subject and wanted to know if the opinion of the trade on the matter had been ascertained.

MR. T. A. DE MEL agreed that the adulteration was not done by the producers, but by the middlemen. He said there was a Sub-Committee of the Low-country Products Association appointed to deal with the matter, and pending their report he thought it advisable to postpone the consideration of the question.

HIS EXCELLENCY thought the suggestion might be adopted, and further discussion of the subject was held over for a future meeting.

Agenda Item No. 3. The Present Position Regarding the Cultivation of Tobacco for European Market.

The Director of Agriculture said that during the year representatives of three tobacco interests had visited Ceylon viz., from—

The Imperial Tobacco Company
The British-American Tobacco Co., and
The Indian Leaf Tobacco Development Co.

All were convinced that the types of tobacco which gave the greatest promise for Ceylon conditions were the Burley types—chiefly White Burley—and this was most suitable for the European market. Experiments had been tried and were conducted in Jaffna, the Dumbara Valley, Ambalantota and elsewhere.

MR. G. HARBORD reviewed the progress made, and outlined results of experiments carried on in Jaffna. He said as a result of experiments conducted since 1919, White Burley tobacco was found to be most suitable. The number of cultivators was steadily increasing, and the progress made was encouraging. He outlined the scheme of experimental trials that were to be adopted at Jaffna. A statement on the subject by the Director of Agriculture was tabled. There was no further discussion on this question.

Agenda Item No. 4.—The Present Position regarding Cotton Cultivation in the Hambantota District.

MR. F. BURNETT, Divisional Agricultural Officer, Southern, read a paper on Cotton Growing in the Hambantota district. He said that as a result of the experiments conducted at the Ambalantota Cotton Experimental Station and Government's scheme for encouraging cotton cultivation, there was a steady growing demand for cotton seed by small holders. The seed supplied by the Department was of the Durango and American Upland varieties and was offered at a reduced rate, payment to be deferred till after the harvest. This year the rains had interfered with the burning of the chenas and the cultivation, but progress was generally satisfactory. The cotton last year was bought by the Agricultural Department and sold to the Spinning and Weaving Mills, Colombo, at a fixed rate. This year other arrangements would have to be made. The CHAIRMAN invited discussion.

The HON. MR. H. L. DE MEL asked whether machinery could be introduced into the district for ginning cotton. MR. BURNETT replied that the question was being considered by the Director of Agriculture.

SIR H. MARCUS FERNANDO enquired whether after the cotton was picked by the cultivators, the plants were burnt so as to prevent the danger of attack from insect pests. MR. BURNETT said that the question had been considered, and that legislation would have to be introduced later on.

HIS EXCELLENCY THE GOVERNOR remarked that the question of cotton cultivation was one of extreme importance, as it was one that concerned Imperial interests. The cotton crop in America was steadily decreasing, and in a few years America would be able to export very little cotton. It was therefore imperative that the Empire should produce its own cotton, if the Lancashire Cotton industry was to survive. Ceylon could take her share in this production. He was of opinion that there were large areas in the country which could be suitably opened up with cotton in the area through which the new railways were to run. He felt that the time was rapidly approaching when British Cotton Growers' Association should be asked to send an expert here to look into the whole question. One important point which he must emphasize was the desirability of seed selection if a high standard cotton was to be produced.

The Director of Agriculture referred to the question raised by SIR MARCUS FERNANDO and said that the matter had been kept in view, and that the existing laws when consolidated would include this question also.

MR T. A. DE MEL suggested that the expert from the British Cotton Growers' Association be sent for early so that his report might be available for the British Empire Exhibition.

The CHAIRMAN thought it could not be done as quickly as MR. DE MEL asked for as the railway through the area would not be ready for another year. He had no objection whatever to writing to the Secretary asking him whether it was desirable that an expert be sent to Ceylon during the coming year.

The discussion then dropped.

Agenda Item No. 5.

Consideration of Motion brought forward by MR. E. F. EDIRISINGHE, MUDALIYAR :—"That, with a view to increasing the food production of the Colony and producing men trained in Agricultural pursuits, that agricultural education be made compulsory in all village and town schools and Colleges in the Island, and that Government should take the necessary steps to provide a supply of teachers for this purpose."

MUDALIYAR EDIRISINGHE in bringing forward his motion said that in Ceylon there was a lack of interest in, and apathy towards, agricultural matters on the part of the general public. This lack of interest and apathy was due to two causes :—bigotry and prejudice on the part of the older generation, and a supreme contempt for agricultural pursuits on the part of the younger generation. The tendency even among village youths of the present day was to leave the village and migrate into towns. He argued that if the boys be given when young a complete education in agriculture, the desire for following agricultural pursuits later on in life, will be stimulated. He therefore pleaded for compulsory agricultural education in villages and

towns. Thanks to the efforts of the Director of Agriculture, something was done in the matter as evinced by the encouragement that had been given to school gardens, an increase in the number of demonstration plots, and the establishment of the School of Tropical Agriculture. He thought that teachers and especially the vernacular teachers should be given a thorough education in Agriculture.

MR. A. A. WICKREMASINGHE in seconding the resolution said that a similar resolution was passed by the Food Production Committee some time ago. Ceylon being an agricultural Colony, the pursuit of agriculture on a scientific basis was essential for its full development. The many efforts made by the Government and the people to successfully increase the food production of the Colony were hindered by the existence of malaria. This must first be overcome. Government should, however, undertake to educate the boys in agriculture.

A discussion then followed—those taking part being MR. D. S. SENANAYAKE, SIR H. MARCUS FERNANDO, the HON. MR. H. L. DE MEL and the Director of Agriculture. The last mentioned confined his remarks solely to agricultural education in Ceylon. At the present time, he said, there were over 500 elementary schools with school gardens and with a view to the improvement of these gardens, courses were given at Peradeniya to twelve selected teachers. Headmen too were trained there. At the School of Agriculture, Peradeniya, higher education in agriculture was given. Next year they would have an agricultural school in Jaffna as well. With a view to systematising the teaching of nature study, in schools, a syllabus had been drawn up and this would be incorporated in the vernaculars. The matter with regard to Secondary Schools was very much more complicated. In course of time, he hoped, however, that Agricultural Science would be taught in schools. Personally he did not like the wording of the motion, but if the mover was prepared to remove the words "be made compulsory" and insert the words "be encouraged" he would accept the motion.

The CHAIRMAN made a few remarks on the subject and stated that the mover would be wise to do away with the words "be made compulsory" in the motion, as suggested by the Director of Agriculture and use instead the word "encourage." MUDALIYAR EDIRISINGHE agreed to the substitution of the words and the motion was carried.

Agenda Item No. 6.—Soil Erosion.

The Director of Agriculture said that the question of Soil Erosion was first drawn attention to by MR. LUSHINGTON during his visit to the Island. It was discussed in detail at the last meeting of the Estate Products Committee, and a sub-Committee was appointed to enquire into the question and report.

This Committee was to make recommendations as to the measures to be adopted for the prevention of soil erosion, more particularly in connection with Government land which it might decide to alienate in the future for cultivation purposes. He brought forward the matter before the full Board to state what was being done in regard to it.

The meeting terminated at 1-45 p.m.

A. W. R. JOACHIM,
Secretary, Board of Agriculture

DISTRICT AGRICULTURAL COMMITTEES.

MATALE.

The Minutes of a Meeting of the Matale District Agricultural Committee held on November 7, 1923, at the Matale Kachcheri.

The Assistant Government Agent in the Chair. There were also present Messrs. G. G. Auchinleck, Divisional Agricultural Officer, N. K. Jardine, Plant Pest Inspector, Dr. Alfred de Silva, the three Ratemahatmayas and Mr. G. F. Abeyakoon, Hony. Secretary.

The Minutes of the previous meeting were read and confirmed.

1. *Vegetable Garden Competitions.*—Tabled 1922-23 results of Vegetable Garden Competitions in Matale South.

2. *Paddy Cultivation Competitions.*—Tabled 1922-23 results of Paddy competitions in Matale North.

As regards 1923-24 Competitions for Matale North and other Divisions on request of the Ratemahatmayas the Divisional Agricultural Officer promised to devise a system of regular reports from the Agricultural Instructors on the progress of Competitions. The reports will be sent to the Ratemahatmayas concerned and later submitted to the Committee.

3. *Cacao Competitions.*—Tabled letter from MR. C. C. BARBER stating his unwillingness to act as a judge. Resolved to ask MR. BARBER to reconsider his decision.

Tabled notice sent by the Divisional Agricultural Officer regarding Cacao Competition. These were amended by the addition of a few words.

Resolved that in future before these leaflets, whether in English or Sinhalese, are printed and issued, the Instructor should consult the Ratemahatmaya of the division so that nothing important is omitted.

4. *Food Products Committee of the Board of Agriculture.*— Tabled notes on a meeting of the Food Products Committee, Board of Agriculture, held at Colombo on 14th August, 1923 sent by MR. W. R. JACKS (Member Food Products Committee, Board of Agriculture).

5. *Shows and Competitions 1923-24.*—Considered letter from the Director of Agriculture regarding allocations for Shows and Competitions 1923-24 and passed a vote of thanks to the Director of Agriculture and the Divisional Agricultural Officer for granting such a good allocation to Matale.

Tabled leaflet on Shows and Competitions to be held at Nuwara Eliya during 1923-24.

6. *Sunnhemp Cultivation.*—Tabled papers regarding results of sunnhemp experiment at Nalanda and discussed.

7. *Rat and Crab Pests.*—Tabled copies of a paper on Rat and Crab Pests submitted by MR. N. K. JARDINE together with the report of the Ratemahatmaya, Matale South. Resolved to circulate report of MR. JARDINE and to bring up the matter for discussion at the next meeting.

8. *Cotton Cultivation.*—Tabled notes on results of cotton trials at Nalanda Experiment Station. Resolved to issue copies to members.

9. *Circulation of Papers.*—Resolved that if there is sufficient time papers about matters coming up for discussion be circulated before the meeting. If there is no time to circulate CHAIRMAN undertakes to send copies of the more important papers to all members.

TRINCOMALIE.

Minutes of a meeting of the District Food Production Committee, Trincomalie, held at the Trincomalie Kachcheri on 12th November, 1923 at 9 a.m.

Present:—Mr. W. L. Murphy, Asst. Govt. Agent, in the Chair and Messrs. G. D. Templer, Deputy Conservator of Forests, W. G. Vallipuram, Office Assistant, Secretary, K Somasunderam, Town Vanniah and A. V. Chelvanayagam, Agric. Instructor.

1. Read and confirmed minutes of the last meeting held on 6th November, 1922.

2. It was proposed by MR. K. SOMASUNDERAM and seconded by MR. A. V. CHELVANAYAGAM that the Sub-Divisional Officer of the Irrigation Department be appointed a member of this Committee, in place of the Divisional Irrigation Engineer. Carried.

3. It was proposed by the CHAIRMAN and seconded by MR. SOMASUNDERAM that MR. B. A. R. HUGHES, be appointed a member of this Committee. Carried.

4. Resolved that in addition to the sum of Rs. 200/- allowed by the Director of Agriculture, a sum of not less than Rs. 300/- be obtained on account of the show and competition plots, and that subscription lists be sent to each Committee member for collection of as much money as possible, informing them that a sum of not less than Rs. 300/- is needed.

5. Resolved that the show to be held next year is to have an industrial section, the show will be held (Monday preferable) at the end of February or early in March on a date to be fixed by the sub-Committee and that the site should be the Central Market.

6. Resolved that the following gentlemen be appointed to form the sub-Committee to frame rules and make all necessary arrangements for the Show :—Mr. W. L. Murphy, Asst. Govt. Agent, Mr W. G. Vallipuram, Office Assistant, the Divisional Agricultural Officer, Mr. B. A. R. Hughes, District Engineer, Mr. G. D. Templer, Deputy Conservator of Forests, Messrs. K. Somasunderam, Town Vanniah, K Vairamuttu, Vanniah, Koddiyarpattu, A. Canagasingham, Vanniah Tamblegam, M. Rasiah, Vanniah Kaddudulampattu, A. V. Chelvanayagam, Agric. Instructor, Mutturaja, Sub-Divisional Officer (I.D.), S. Thiagarajah and M. M. Subramaniam with power to add to their number.

Mr. S. CANAGASURIAM to be clerk to the Committee.

7. Resolved to have competition plots for paddy and garden produce

(a) Paddy plots for Pinmari cultivation in Koddiyar and Tamblegam. Dates and details to be arranged by the Sub-Committee after consultation with the Chief Headman.

(b) Garden Competition to be open to the whole district. All the Chief Headmen are to be invited to enter the competition as an example to the people of their divisions.

Applications to be registered on or before 15th December next. Further details will be arranged by the Sub-Committee.

(c) Application for registration (paddy and garden) should be sent to the Secretary through the Chief Headmen accompanied by a fee of cents fifty each. Chief Headman to collect this fee from applicants and remit it, to the Secretary.

(d) The Sub-Committee which will be the same for the show (vide resolution No. 6) to frame rules regarding competition plots.

8. The following are appointed judges of competition plots (paddy and garden) :—

1. The Assistant Government Agent, Trincomalie
2. The Kachcheri Mudaliyar
3. The Agricultural Instructor

Resolved that fruit trees, for distribution to any applicants for them, be obtained from Peradeniya on their understanding to pay cost, and the Chief Headmen and Agricultural Instructor be asked to send on lists of what are required.

MATARA.

Proceedings of a Meeting of the Food Production Committee held at the Kachcheri on the 19th November, at 10 a.m.

Present.—MR. G. S. WODEMAN (in the chair) and the following :— Messrs. F. Burnett, Divisional Agricultural Officer ; G. Altendorf, M. Junoos. B. Samaraweera, J. E. Wijesinghe, Dr. V. D. Gunaratne, Mudaliyars W. A. Amarasekara (Secretary), S. W. Ilangakoon, H. E. Wickramaratne, W. A. Wijesinghe, Messrs. B. A. Perera, H. C. Peiris. P. C. Goonaratne and Francis Wijesinghe.

Minutes.—The minutes of the meeting held on the 12th November, 1923 were read and confirmed.

Board of Agriculture Representative.—It was resolved that MUDALIYAR W. A. AMARASEKERA be nominated as representative of the Committee on the Board of Agriculture.

Competitions for 1924.—It was resolved that transplanting and vegetable garden competitions be restricted to members of the Co-operative Societies and that paddy transplanting competitions be held for the ensuing Yala in Weligam Korale, Morawak Korale and Kandaboda Pattu and garden competitions in Four Gravets, Wellaboda Pattu and Gangaboda Pattu and that the judging of the transplanting plots be tentatively fixed for August and garden competitions for July.

It was further resolved that the existing conditions be observed in respect of transplanting competitions and that the area of a garden entering for the competition be not less than half an acre.

Apportionment of Grant and Prizes.—It was resolved that the Government Grant of Rs. 370, apportioned for prizes, be supplemented by a contribution of Rs. 250, from the Huwandiram Funds and that the amount be divided as follows:—

(a) Rs. 20, to be apportioned for printing charges.

(b) Rs. 95, for prizes for each of the 6 Divisions to be divided in 3 prizes of Rs. 50, Rs. 30, and Rs. 15.

(c) Rs. 5, for each division to be awarded to the Hony. Secretary of Co-operative Credit Societies who secure the largest number of competitors.

District Agricultural Committee.—It was resolved to recommend that the name of the Committee be changed to " District Agricultural Committee" and that its functions be enlarged so as to cover all matters relating to agriculture in the District.

The meeting terminated with a vote of thanks to MR. BURNETT, D.A.O., for coming from Galle to attend the meeting.

SOILS AND MANURES.

NOTES ON THE TREATMENT OF *CENTROSEMA PUBESCENS* SEED.

E. F. VANDER MUELEN.

Agriculturist, Buitenzorg, Java.

Preliminary.—Our germination experiments show that germination is quicker and more regular if the seed has been soaked in water at about 60° Celsius, a temperature easily obtained by mixing equal quantities of boiling water and well water.

The seed should be left in the water to cool off. If the seed is to be planted out at the beginning of the West Monsoon with its moderate rainfall then it is advisable to leave the seed soaking in the water for a night. If planted out at the height of the West Monsoon then it should be planted out directly the water has cooled off.

As the plant in its youth appears to be very sensitive to the force of heavy rain it is advisable to begin planting out directly the first rains begin; when older the plant does not suffer from heavy rain; the mother-garden is situated in a district with an annual rain-fall between 5,000 and 6,000 millimetres 200/240 inches) and a very pronounced East (dry) Monsoon. At the height of both the East and West Monsoon the cover there remains a fresh green.

Planting out.—Like all other green manures *Centrosema pubescens* requires a loose soil to ensure quick growth and it is desirable to make the planting hole a patjol (tjangkol) blade deep and to break up the clods of earth and mix them with a little stable manure. It is specially important that the seed should not be planted too deep, and it is quite sufficient to push the seed at most 1 centimetre (say ⅓) into the loose earth and then press a little soil over it. Coolies are always inclined to plant too deep, especially when working with a planting stick. Any seeds, i.e., those much swelled by the soaking in water, lying above ground are much damaged by ants etc.

Although *Centrosema* when it has once caught on stands shade very well it starts badly in shade and it is therefore advisable to plant it first in places where plenty of light can reach the soil.

In old gardens it is most to be recommended for vacancies caused by thinning out etc., garden boundaries, road edges, etc., etc. It is in such places that one finds most weed growth and grasses and it is just here that this cover plant will give its best services with its great capacity for throwing out shoots, and it is from these nesting centres that it spreads in all directions.

In heavy shade *Vigna* is more suitable and a combination of these leguminosæ would appear promising for gardens already closed up.

For old gardens where the Rubber trees were formerly heavily top pruned and now vigorously thinned out *Centrosema pubescens* by itself is very

suitable and will quickly form a complete cover.

A planting distance of 3 × 3 feet with 2 or 3 seeds in each hole is sufficient and 1 lb. (15/18,000 seed) will plant a bouw (1·75 acres).

For young gardens we consider it the best cover plant after *Mimosa*; this catches on in weedy gardens and quickly smothers the weeds, but *Centrosema pubescens* will only catch on in clear ground and requires care for some months. It is necessary to weed it a time or two, but if it has once closed up and covered the ground it will then smother any weeds that may come up.

One advantage of *Centrosema pubescens* over *Mimosa* is that it does not die back in the dry weather and this protects the soil from drying up just during the wintering time.

It is desirable to give it temporarily a chance to climb by putting branches or thin bamboos in the immediate neighbourhood, which facilitates weeding for the first few months and also assist the development of the plant.

For washed-out, poor soils on which Leguminosæ as a rule catch on badly, we recommend the following rather laborious but very efficient method of planting :—

Lay 5 or 6 seeds out in bamboo baskets of about 25 centimetres (10 in.) high and 15 c.m. (6 in.) diameter, filled with a half mixture of stable manure and earth, and water the baskets daily in dry weather. In each basket place a thin bamboo up which the plant can climb and after some months transfer the baskets to the gardens. To start with, one basket in the cross of 4 Rubber trees or in vacancies in a 5 × 5 foot planting distance will be sufficient.

If economically done the cost of this work is surprisingly low and the chance of successful growth very much increased.

Centrosema pubescens seems to catch on best on heavy, but porous soil where it forms a fine, luxuriant cover.

Seed setting can be much assisted by giving the plant a chance of climbing before the dry weather.

ADVICE ON SOIL MANAGEMENT FOR THE PLANTER.

DEEP PLOUGHING DESIRABLE.

This is the time of year to think about ploughing. A lot depends upon the way ploughing is done, much more indeed than many people are willing to admit.

It is always admitted in countries where good farming is the rule rather than the exception, that deep ploughing is an indication of good farming. In the average community, those farmers who plough deeper than their neighbours are considered to be the most successful managers, because deep ploughing means increased efficiency in the use of the natural resources of the soil.

Distinction should, however, be made between deep ploughing and subsoiling. The latter consists in loosening the subsoil without bringing it to the surface or mixing it with organic matter. Its practice as to soils and seasons is far more limited than deep ploughing.

There are many reasons why deep ploughing is beneficial. In the first place the heavier soils, including clay and those which tend to take on the character of a hard pan, are loosened up, which enables the roots to penetrate easier and the soil to absorb the rain water. Often the roots of crops are confined to a rather shallow surface region of soil by the refractory condition of the soil beneath. It is in such cases particularly that subsoiling would prove helpful.

Since all good soil management involves the use of organic manures of one sort or another, deep ploughing results in mixing this more thoroughly with the soil, with resultant benefit. As a general rule the failure to maintain a reasonable supply of organic matter in the soil coincides with a large decrease in productive capacity, not because the soil is exhausted in total food supply, but because bad physical conditions of the soil results, and the availability of the plant food present is thereby reduced. An important result is to increase the capacity of the soil to hold water in a form available to crops.

Where crops are likely to suffer from a lack of water, which is especially the case on light, sandy soils, and also gravelly soils, deep ploughing and the generous use of organic manures, coupled with thorough surface tillage, is the primary method for the control of such conditions. On both sandy and clay soils this practice will increase the soil moisture to an extent equal to one or more inches in rainfall, and since the total amount of water required to produce medium yields of crops is only eight to ten inches of rainfall, this saving may be an important factor in success.

A fertile soil teems with minute organisms which are beneficial in many ways, such as the proper decay of manure and stubble, and the gathering of nitrogen from the air. Stirring the soil, which exposes it to the air and gives it a better relation, stimulates these organisms and increases their number and activity.

Experiments carried out in America have shown that ploughing from eight to ten inches deep increased the number of bacteria and their production of ammonia, and reduced the tendency to the wasting of nitrogen commonly known as denitrification.

All of the effects mentioned react upon the soil itself to increase the availability of the plant food present. The normal soil must be regarded as an immense store of mineral plant food elements in a slightly available form. A primary object of tillage is to increase the availability of these materials, so that the crops can obtain what they require of potash and phosphorus.

The subsoil is just as rich in these constituents as the soil, but it is only by the maintenance of the conditions associated with deep ploughing that they can be used as effectively as possible. Such methods proportionately reduce the need of commercial fertilisers, which are relatively expensive.

When coupled with the generous use of organic manures there is no soil condition where deep ploughing is not beneficial. But on light sandy and gravelly soils, which are already more loose than is desirable, no benefit will follow from deep ploughing without manure.

On heavy soils deep ploughing is beneficial, irrespective of the use of manure, because of the structural change. It has been observed that green manures ploughed under shallow is positively injurious in many cases, but deep ploughing gives beneficial results. Humid and arid regions, temperate and tropical regions alike respond to deep ploughing. Its practicability may vary somewhat with the season, quantity of manure turned under, and the succeeding crop, but these limitations cannot be discussed here, and on the average they had better be disregarded rather than that deep ploughing should not be practised.

Since deep ploughing involves turning the lower material up to the surface, and in certain regions the subsoil tends to have some poisonous properties, it is not wise to increase the depth of ploughing too rapidly. An inch each ploughing is as much as is ordinarily safe where the fresh soil is turned on top. If it is only partially brought to the surface, as is the case with a certain type of implements, the increase in depth may be greater.

Ploughing to a depth of from nine to 12 inches is ordinarily practical and is certainly desirable. There are, of course, limitations in the matter of draught, but in many instances more animals and larger implements are in the line of efficiency and economy.

PREPARATION OF THE SOIL FOR PLANTING.

After a field has been turned over, and is lying with its fresh surface exposed to wind and weather, the length of time that the land should be left before being worked down depends, firstly, on the time at the farmer's disposal, and, secondly, on the type of the soil. It is best to leave the land till the weeds start to come up, and then give it a good discing with the furrow. This may have to be repeated if the land is heavy and does not cut up too well the first time. The second stroke of the disc will do far better if the tine harrows are run over the once-disced soil to stir up and level the surface.

If the discs are used several times without a harrowing in between, the surface of the ground gets very uneven and is bad for rolling. This is especially so in heavy country. If the field can be left now for a few days, it will do it a great deal of good. If, in the meantime, much rain has fallen, it will pay to disc again before harrowing. A good heavy tine harrow is both economical, in that the tines do not easily break, and efficient as the tines get in well and stir the soil deeply as well as pulling out the weeds. If the farmer has a lot of ground to work down, a good big spread of harrows (say five leaves) will soon save their cost in time saved. A span drawing a five-leaved set will harrow thirty acres or more per day. After the harrows have done as much good work as they can do it must be decided what implement will come next. If there are any clods it might pay to disc again. If the surface is lumpy then the roller is needed.

A very useful home-made clod crusher may be made as under:— Cut four blue-gum poles of a length suitable for negotiating the gates of the

farm, and a weight suitable to the strength of the team. These poles are chained together about 2 feet apart, and a suitable coupling is fixed on to the middle of the front pole. A seat can be fastened on to the crusher where it is thought to be convenient. It will be found that this simple implement is very cheap, and it does excellent work. It will break up clods and lumps, and leave a good seed-bed behind it.

After the land is rolled or crushed, it may be necessary to tine harrow again, and, indeed, these operations of rolling and harrowing should be alternate until the surface is in a state of fine subdivision and the weeds are dead on top. After the final rolling, some prefer to give the field a stroke with the tripod harrows, bevel edge first or one with the inverted tines to make a good bed to sow on.

A good many men have the implements, and they work by rule of thumb, plough, disc, harrow, roll and sow. That may be all right in some cases, but in the great majority of cases the field would neither be clean nor worked. It should always be a hard and fast rule never to sow a seed until the field is clean. If the field is not clean, it simply means that the ploughing and subsequent work is wasted, as all the farmer will get will be a good crop of weeds and a stunted lot of specimens of the crop he has sown. It cannot be too clearly understood that the very best job made of the field is absolutely the only one that will do.

Many readers, no doubt, will say that this looks very nice on paper, and that the time taken up will be too great. That is not so, and what is written here is the result of practical experience. The man who saves and gets his cane in first will practically always find that his neighbour who has made a good job of the field and sowed his seed a bit later will have a far better crop which will soon catch up to the one sown first.—SOUTH AFRICAN SUGAR JOURNAL, Vol. 7, No. 10.

SOIL SOURNESS.

Among the most stimulating and useful of the discussions held in the Botanical Section during the recent meeting of the British Association in Liverpool was one on soil sourness. This is indeed not surprising, since, in addition to its theoretical interest to the botanist and the chemist, the subject presents many problems of great importance to the farmer and, albeit, less urgently owing to smaller scale and more intensive culture, to the gardener also.

Attention was directed to the fact that soil "sourness" and soil "acidity" are not interchangeable terms. The conditions described do not necessarily occur together, although some degree of acidity is commonly a feature of "sour" soils.

In practice, soil "sourness" is recognised by the characteristic failure of certain crops; by the dominance of certain weeds, e.g., Field Spurrey and Sheep's Sorrel; by the prevalence of certain diseases, notably Finger and Toe of Cruciferous crops; and, lastly, by the rectification of all these conditions that immediately follow an application of lime or chalk to the soil.

Now the cause of "sourness" is not acidity of hydrogen-ion concentration, since this may be high when "sourness," as above defined, is absent.

The following features are associated by the soil chemist with soils of this class:—(1) Acidity on high hydrogen-ion concentration; (2) a high power for absorbing lime; (3) characteristic ratios expressing the proportions of the various soil bases present—calcium, magnesium, sodium and potassium on the one hand with the so-called weak bases—aluminia, iron, manganese, etc., on the other.

That the problem is a very complex one is indicated by the fact that, although the peculiarities just cited are invariably found in "sour" soils, cases are not lacking of certain soils, rich in organic matter, which possess these characteristics without the corresponding phenomena of "sourness." While the practical grower associates the problems arising from soil sourness more especially with the failure of certain crops, the plant ecologist finds that the prevalence of certain species in the field is a reliable indication of sourness, although he is puzzled at present to know whether the characteristic healthy type of vegetation so frequently found on these soils is correlated directly with the scarcity of lime salts or with the acidity and deficiency of oxygen usually coupled with this scarcity of calcium.

Much experimental work bearing directly or indirectly on the problem is in progress, both in this country and in the United States. More especially may results of special interest be looked for from the three following lines of research:—(1) The significance of acidity (hydrogen-ion concentration) in relation to plant growth; (2) the effect of variation in the proportions of the various soil bases, more especially calcium, magnesium, sodium, potassium and aluminia; and, closely associated with the latter, (3) the real significance of the so-called lime-shy or calcifuge habit in certain groups of plants.

Bearing on the first of these, DR. E. F. SALISBURY contributed a paper at Liverpool in which the results of numerous observations on the degree of soil acidity associated in nature with the distribution of particular plant species were expressed as curves. It was suggested that certain species, e.g., the Bracken, has a natural distribution closely associated with the degree of soil acidity, a well-marked "optimum" being recognisable in the curves. On the other hand, discussion elicited the fact that no experimental data were available to support the view that the soil reaction behaved as a critical factor.

Both in the country and in the United States data are rapidly accumulating recording the association of particular species with varying degrees of soil acidity, and experimental work is in progress to test the existence or not of critical degrees of acidity for individual species.

At present no sure conclusions can be drawn, and it must not be forgotten that many difficulties of interpretation arise. For example, the presence of certain plants, e.g., Sheep's Sorrel is often regarded as an indication of sourness. Experimentally, it is known that Sorrel will grow quite well on calcareous soils, and in general it must be recognised that a plant may grow well on "sour" soil, not because the condition is specially favourable to it, but because being relatively tolerant of sourness, it flourishes owing to lack of effective competition.

Similarly, a plant species may be absent from natural vegetation, not because it cannot tolerate the soil conditions, but because its toleration is less than that of any of its competitors.

In another field of research, a group of workers attaches great importance to what may be called the "basic ratio" of the soil. It was pointed out by DR. COMBER that the cause of sourness is not merely the ratio of calcium to other bases (e.g., potassium and sodium), since the addition of neutral calcium salts does not reduce the sourness, and the addition of potassium and sodium salts does not enhance it.

In the rather special case of Heath plants, which so commonly form the natural vegetation on sour soils, it is held by certain workers that the important basic ratio in the soil is the proportion of sodium, potassium and magnesium, to calcium, on what is termed the $\frac{K + Na + Mg}{Ca}$.

There is also some evidence that the ratio of basic lime to weak bases especially aluminia, may be a fundamental cause of sourness—a view which fits in well with the known toxicity of aluminium under certain conditions.—M.C.R.—GARDENERS' CHRONICLE, Vol. LXXIV. No. 1923.

SOIL ORGANIC MATTER.

THE SIGNIFICANCE OF LEGUMES.

H. WENHOLZ B.Sc. Agr.,

Special Agricultural Instructor.

Farmers often inquire as to whether the ploughing in of weeds as green manure is not as good practice as ploughing in a legume which has been specially grown for the purpose. Experiments in New South Wales have shown that better results usually follow green manuring with a leguminous crop than with a non-legume under most conditions, but no reasonable explanation of these results has ever been given.

Considerable light is now thrown on the matter by some work carried out at the Washington (U.S.A.) Agricultural Experiment Station. It has been found that* the nitrogen-carbon ratio in soils, irrespective of their origin, is practically a constant, and tends to remain so. Taking carbon as an index of the organic matter in the soil, this indicates that the soil organic matter cannot be increased, or even mentioned, unless the necessary nitrogen is provided.

Further, it has been shown† that the nitrogen-carbon ratio in the material returned to the soil has a very pronounced influence on the kind

* WASHINGTON AGR. EXPT. STN., BULL. 176 (1923)

† WASHINGTON AGR. EXPT. STN. 31st Rept. (1921)

and rate of decomposition. Organic material like non-legume straw, having a wide nitrogen-carbon ratio (1 to 75), has a depressing effect on nitrate development when applied to the soil, and such effect is seen until there has been sufficient decomposition to cause the ratio to approach that of the organic matter in the soil. On the other hand, where organic matter having a narrow nitrogen-carbon ratio (1 to 10), like legume hay or legume green manure, is incorporated into the soil, there is an immediate and rapid nitrate development. There is also less loss of carbon dioxide (Co.2), and an indication of greater maintenance of organic matter.

These discoveries emphasise the superiority of the legume for green manure for supplying organic matter, and also in those cases where it is desired to increase the available nitrogen in the soil, as in cold districts or with winter crops where nitrification is naturally slow, but also in warm districts with a good rainfall, where the nitrogen has been depleted by leaching. Where cultivated crops like maize and potatos are largely grown the loss of organic matter is greatest, and it seems from these discoveries that leguminous crops must be grown if the yields of the main crops are to be maintained. Whether the legumes are used for green manuring or fed off by stock will have to be determined by the individual farm economy.

In our wheat belt we have generally found that a wheat crop on stubble land has yielded better after the burning or removal of the straw stubble than when the straw stubble was ploughed under. We have, in the past, ascribed this difference very largely, if not solely, to the insufficient consolidation and moisture-holding capacity of the sub-surface where organic matter difficult of decomposition was ploughed in, but the bulletin referred to gives a further reason for the difference. The reduction in yield is ascribed to the transformation of nitrogen already available for plant-food into a non-available form. It is stated that the application of straw to the soil stimulates the increase of bacteria, which use the straw as a source of carbon and the nitrates in the soil as a source of nitrogen. The nitrates are transformed into organic nitrogenous material, and for the time being are lost as available plant-food. The more straw applied the greater is the loss of nitrates. Nearly all the carbon is lost as carbonic acid (Co.2), and with its loss non-leguminous crop residues like straw cannot be materially depended on to influence the soil organic matter. Paradoxical though it may seem, the return of organic matter to the soil in the form of wheat or oat straw does not apparently increase the soil organic matter any more than burning the straw under these conditions.

In hot, dry districts, where nitrogen losses from the soil are light, it is thought that there may be sufficient free fixation of nitrogen for maintaining, or even increasing, the soil organic matter. This would explain, further, why fallowing in such districts is to be preferred to even rotation cropping.

PESTS AND DISEASES.

THE LIME (CITRUS) TREE BORER

(*CHELIDONIUM CINCTUM, GUER.*)

K. KUNHI KANNAN, M.A., Ph.D.,

Mysore Agricultural Department.

The early stages of this serious pest of lime and other citrus trees were first described very briefly by MR. ANSTEAD, now Director of Agriculture, Madras, in a note read before the 3rd Entomological Conference held at Pusa in February 1919. Certain important details pointing to a very simple remedy were, however, not observed by him. An account of these may not, therefore, be unwelcome to those who are interested in the cultivation of these valuable fruit trees. It was observed last year that the adult insect,—a metallic green beetle with a yellow cross bar on the wings,—emerges from the pupa late in the hot season towards the end of April or early in May. But on reaching the adult stage the insect does not immediately get out of the tree but remains there a good long while in the pupal chamber made by packing borings into partition walls before and behind the beetle in the tunnel it has made. Closely adjacent to each wall, there is a layer of chalk secreted evidently by the grub before it turned into a pupa. The beetle has a very fine smell, re-calling that of lemon grass oil but not quite like it. Soon after the first heavy showers of the monsoon are received, the beetle gets out of the tree. No adults have yet been detected in the lime groves, but late in June when eggs were looked for, they were found. At that time several twigs in each of the trees, smaller than a lead pencil in size, were observed withering and a little below these usually at a fork or at the origin of a spine, gummy exudations were noticed. When these latter were examined, the egg shells were found submerged in the gum or floating on the top of it. They were of a diaphanous green, broadly oval and with a rim all round and a delicate honey-comb pattern on the top surface. Where the eggs had failed to hatch, or their contents had been devoured by parasites there was no gum and they were found firmly fixed in the fork. The gum clearly, therefore, comes afterwards and as a result of the initial work of excavation of the young grub. The young grub eats a small oval patch of the bark just below the egg and then buries itself into the twig making a cork-screw cut round the twig, which, though it does not usually involve the bark, extends to the pith and is so complete that with a very light pull the twig can be broken off. After eating round the twig in this way the grub proceeds along the pith upwards towards the extremity of the twig.

As a result of the cork-screw cut gum exudes with which submerges the empty egg-shell or lifts it off from its place. When the young grub hatches out plenty of rains have been received and there is a vigorous circulation of the sap for the growth of the fresh leaves noticed about this time. The larva in all its stages of growth requires plenty of ventilation and makes small

holes along its track for the purpose. Unless therefore the circulation of the sap is cut off the air holes that it makes in the twig would soon get blocked up with gum and would not allow for proper respiration. It is therefore for this reason that the cork-screw cut is made by the grub. For much the same reason it is that the grub works its way upwards into the twig. For it is obvious, in a downward course, to cut off the sap first and then excavate is impossible.

How long the larva remains in the drying twig has yet to be determined but it is certainly at least a month. It appears likely that the return journey does not take place until the sap circulation becomes less vigorous. The course to the main part of the tree also is marked by air holes through which the borings are discharged from time to time.

From the detailed description given above a simple remedy suggests itself. The cork-screw cut of the twig selected by the larva for its early excavations is so complete that a gentle knock or pull is all that is required to break it off and since the larva remains in the twig for at least a month the removal of the twig will secure the grub before it has had time to work its way back into the main part of the tree. The pruning of the drying twigs suggested in ignorance of the early habits of the grub is laborious and troublesome on account of the numerous spines of the tree. In the light of the habits now described such a procedure appears not to be necessary. The twig in which the larva works is easily noticed by its withering and the place of egg-laying by the exudation of gum which is fairly conspicuous. With a long stick ending in a narrow fork the dry twig can be easily removed. The twig is caught in the fork and a sharp turn is given to the stick in the hand when the twig is broken off and drops to the ground. No further action is necessary. The twigs may be left on the ground and the grubs having but very feebly developed legs cannot make their way again into the tree. This operation has been tested and found to be very easy, and there is at least a clear month after the twig has begun to dry in which to carry it out.—JOURN. OF MYSORE AGRIC. & EXPT. UNION, Vol. V. No. 3.

BANANA EXPERIMENTS.

H. W, SIMMONDS, F.E.S.,

Acting Government Entomologist, Fiji.

The following banana experiments against the borer *Cosmopolites sordida* were carried out in the garden of the Agricultural Department, Suva :—

The object was to see whether it would be possible to obtain a stand of bananas clean of borer *Cosmopolites sordida*, using suckers from affected plots. With this object in view the garden (which had had no bananas growing in it for many years) was dug up at both sides and back, and in July, 1921, the following suckers were placed in it :—

(*a*) Four Blue Javas taken from the Cottage Home. This was a nice looking block bearing good fruit, but with considerable borer present;

(*b*) Two Ladies Fingers. The plants these were taken from were very poor, and borer was also present;

(*c*) Three Cavendish. These were taken from a block very badly infected with borer.

All were carefully scrubbed and every effort made to see that no borers or eggs were present, yet despite these precautions three of Javas and two of the Cavendish quickly showed by their failure to make growth, and yellowness, the presence of borer, and these were at once dug up and burned, borer being present in numbers in each.

The others went ahead well except that the remaining Java presently developed bunchy-top. This was unexpected as there was no bunchy-top present in the original clump or near, but since then two other clumps in the neighbourhood have developed the disease.

The other three plants went ahead well and threw some fine suckers. Two of these suckers were removed from the Cavendish and planted out—

(1) Near the bunchy-top Java, and this one quickly developed bunchy top itself;

(2) In a distant part of the garden, and this went ahead well.

A year later another sucker was taken off this plant and no sign of borer was found in doing so.

Just before the bunch on this banana was ready to cut, one of its suckers showed yellowness, and, on digging out, was found to be affected by the beetle. This was removed and burnt, and since then no sign of borer has been found in the plot.

So that, despite the utmost care in selecting and washing suckers, borer is likely to be introduced. Nevertheless, if prompt measures are taken and all affected plants dug out as soon as they show signs of being affected (and the majority do this within three months of planting) the disease can be so far kept under control as to have comparatively little effect upon the yield of fruit. Further, if suckers are taken from young plants in planting up there is far less risk of introducing borer than when suckers are used from old plants.

It is absolutely necessary that the ground shall be clean before planting and to bring this about all old plants shall be dug out and burned, at least a year before it is intended to plant up with bananas, meanwhile the land can be used for some other crop. The borer has never been known to fly, and infection takes place from diseased suckers and from beetles crawling from neighbouring plantations. To prevent this latter, traps can be set, consisting of pieces of banana corn laid between the two estates and examined underneath daily for adult beetles. New traps should be used and the old ones burnt every two weeks.—AGRIC. CIR. DEPT. OF AGRIC., FIJI, VOL. 5. NO. 1.

POULTRY.

STANDARD VARIETIES OF CHICKENS.

THE AMERICAN CLASS.

ROB. R. SLOCUM,

Formerly of the Animal Husbandry Division, Bureau of Animal Industry.

(Revised by Alfred R, Lee, Poultryman, Animal Husbandry Division.)

Practically every farm in the United States keeps chickens. In the majority of instances the flock of poultry is kept merely as a side line, to utilize material which otherwise would go to waste, and to furnish eggs and meat for the farmer's table. At many seasons of the year the flock will produce a large surplus over what is needed for the farmer's own use, and this when sold yields a considerable income, sometimes sufficient to pay for the groceries and wholly or in part to clothe the family.

THE KIND OF CHICKEN THE FARMER WANTS.

To meet these demands the farmer therefore desires a breed or variety of chickens which are not only good layers, but also have size enough to provide suitable carcases for the table. The breeds which meet these two demands are commonly called the general-purpose breeds and in the main are those comprising the American class as given in the American Standard of Perfection. The Orpington, belonging to the English class, is also a well-known general-purpose breed in this country. The general-purpose breeds are uudoubtedly the most popular breeds in the United States. Certain of these, namely, the Plymouth Rocks, Wyandottes, Rhode Island Reds, Orpingtons, and Jersey Black Giants, compose the bulk of purebred poultry kept on the general farms and their blood is evident in most of the farm flocks.

CHARACTERISTICS OF THE GENERAL-PURPOSE BREEDS.

In size the general-purpose breeds are intermediate between the meat breeds, such as the Brahmas, and the egg breeds, such as the Leghorns. They are of a much quieter temperament than the egg breeds, and for that reason are more easily handled in confinement. They mature earlier than the meat breeds, but not so quickly as the lighter egg breeds. In activity and ability to "rustle" for a living they are again intermediate between the meat and the egg breeds, but are good foragers. Because of the fact that they fatten readily and are of a fair size they are very popular with the poultry packer, and sell to better advantage in those localities where the farmer is compelled to look to the poultry packer for a market for his fowls.

Because of the tendency for the general-purpose breeds to put on fat much more readily than the egg breeds, they must be fed more carefully when kept in confinement; otherwise there is a tendency for them to "break down behind"—in other words to accumulate an excessive amount of fat in the abdominal region. Where the fowls have free range, however, this trouble is not likely to occur.

They are sitters and make good mothers. This is an important consideration where the farmer keeps only a small flock and does not wish to invest money in hatching and brooding equipment. These birds are layers of brown eggs. In consequence, they are not so suitable for conditions where a premium is paid for white eggs; under such conditions, where large poultry farms have been established, the White Leghorn has come to be the most popular fowl.

All the American breeds are clean legged; that is, they have shanks free from feathers. They also have yellow legs and skin, except the Java and the Jersey Black Giant, in which the legs are black or leaden blue and yellow. In the markets of the United States the former is a desirable point as the demand is for yellow skin and legs in table fowls.

BREEDS AND VARIETIES.

The American class includes the following standard breeds and varieties:—

Breeds.	*Varieties.*
Plymouth Rock	Barred, White, Buff, Silver, Penciled, Partridge, Columbian, Blue.
Wyandotte	White, Buff, Silver, Golden, Partridge, Silver-Penciled, Columbian, Black.
Java	Black, Mottled.
Dominique	
Rhode Island Red	Single Comb, Rose Comb.
Rhode Island White... ...	Rose Comb.
Buckeye	
Jersey Black Giant	
Chantecler	

In describing these breeds and varieties it is the intention to give only a general statement of their appearance and characteristics. For a description sufficiently detailed to enable one to breed exhibition specimens it will be necessary to refer to the American Standard of Perfection, a book published by the American Poultry Association, which is the guide by which all the poultry shows in the United States are judged.

THE PLYMOUTH ROCK.

The Plymouth Rock has been for years the most popular breed in the United States. The Barred Plymouth Rock was the original variety and was developed in the United States, various lines of blood being used in the making. It is probable that the Dominique, the Black Cochin, the Black Java, the Brahma, and the Pit Game were used for this purpose. The size and type of shape of all the varieties of Plymouth Rocks are supposed to be identical. In general the breed may be described as a good-sized, rather long-bodied chicken, with fairly prominent breast and good depth of body, showing when dressed a well-rounded, compact carcase. This breed has a single comb and yellow legs, bill, and skin. The standard weight of cocks is 9½ pounds; of hens, 7½ pounds; cockerels, 8 pounds; pullets, 6 pounds. They are layers of good-sized, brown-shelled eggs, and are reputed especially as winter layers.

The Barred Plymouth Rock is by far the most popular general-purpose or farm fowl. This variety has so long been a favourite with the general public that the barred colour is generally associated with quality in table fowls. The Barred Plymouth Rock plumage is a grayish white, each feather of which is crossed by dark bars which are almost black. It is desired that these bars should be as even in width, as parallel, as straight, and as well carried down to the skin as possible. Each feather should end with a narrow, dark tip. The barring in the hackle and saddle is narrower than in other sections. The alternating dark and light bars give a bluish cast or shade to the general colour, which should be even throughout the surface. It is common for solid black feathers or feathers which are partly black to occur in practically all strains in this variety, but this should not be taken as a sign of impure breeding. Black spots are also common occurrences on the shanks, particularly in females, but this does not indicate impurity.

There is a decided tendency for the males of this variety to come lighter in colour than the females, and for this reason breeders are usually obliged to resort to two separate matings, one for the production of males of standard or exhibition colour and the other for the production of females of standard or exhibition colour. This system of breeding is known as double mating. In mating for males of exhibition colour a male of about standard colour is used with medium dark females, or those two or three shades darker than females of exhibition colour, in which the barring is as distinct and as narrow as possible, showing a clear-cut line between the black and white bars. This mating is known as the cockerel mating, because it produces a greater percentage of exhibition or standard-coloured males, while the females produced are too dark in colour for exhibition, but are suitable for continuing this line of breeding. In mating for females of exhibition colour, females of about standard colour are used with a medium light male or one that is two or three shades lighter than males of exhibition colour, but which shows distinct barring and as strong barring in the undercolour as can be obtained. This mating is known as the pullet mating, because it produces a greater percentage of females of exhibition colour, while the males produced are too light for exhibition, but may be used to continue this line of breeding. Several of the poultry shows in the United States have two separate classes in the Barred Plymouth Rocks, one for dark barred and one for light barred, in which both males and females are exhibited.

The White Plymouth Rock is the second most popular variety of this breed. All the characteristics of the White Plymouth Rock are supposed to be identical with those of the Barred Plymouth Rock except colour. As a matter of fact the White Plymouth Rock tends to run somewhat larger in size, and the type is a little more uniform and a little better than that of the Barred Plymouth Rock. In colour the White Plymouth Rock should be a pure white throughout, free from black ticking and from any brassiness or creaminess.

The Buff Plymouth Rock is distinguished from the other Rocks by the colour alone, which should be an even shade of golden buff throughout. Shafting, or the presence of feathers having a shaft of different colour from

the rest of the feather, and mealiness, or the presence of feathers sprinkled with lighter colour as though powdered with meal, are undesirable. As deep an undercolour of buff as it is possible to obtain is desirable. There is a great difference of opinion as to what constitutes desirable buff colour, some favouring the lighter colour, approaching lemon, while others favour a much darker buff, approaching red. The important point is to have the shade as even as possible over the entire surface.

The Silver-Penciled Plymouth Rock is one of the new varieties. Its plumage is distinctive and very beautiful. In general, the plumage of the male consists of a silver-white top colour, extending over the shoulders and back, the hackle and saddle striped with black. The rest of the body plumage, including the main tail feathers and sickles, is black. The wings when folded show a bar of black extending across below the shoulder. Below this the wing shows white, due to the white on the outside of the secondaries. In the female the general trend of colour is gray, with delicate distinct, concentric penciling of dark on each feather except the hackle, each feather of which is silvery white with a black centre, showing a slight gray penciling, and the main tail feathers, which are black, with the two top feathers showing some penciling. The colour of the plumage is practically the same as that of the Dark Brahma.

The Partridge Plymouth Rock is also one of the newer varieties of this breed. The colouring of this variety is very attractive and is practically the same as that of the Partridge Cochin and also of the Silver-Penciled Plymouth Rock, except that the white of the Silver-Penciled is replaced by red or reddish brown.

The Columbian Plymouth Rock, a variety of comparatively recent origin, is very attractive in colouring and has proved quite popular. In general the colour is white, the hackle feathers being black with a narrow edging of white, and the main tail feathers black, the tail coverts being black with a distinct white lacing. The wings also carry some black on the primary and secondary feathers, which is almost hidden when the wings are folded. The colour of this variety is practically the same as that of the Light Brahma.

The Blue Plymouth Rock is a recent variety obtained by crossing the Blue Andalusian on the Barred Plymouth Rock. This variety should have typical Plymouth Rock type combined with Blue Andalusian colour. This breed has general characters similar to those of the other varieties of Plymouth Rocks. A general top colour of dark, lustrous blue, approaching black, is the standard for the male. This colour extends over the hackle, back, saddle, shoulders, sickle feathers, and tail coverts. The rest of the plumage is a slaty blue showing a well-defined lacing of darker blue in all sections. In the female the general plumage colour is a slaty blue of even shade, each feather except the primaries having a clear, well-defined, narrow lacing of darker blue similar to the breast colour of the male. The neck is decidedly darker than the rest of the body colour. Both sexes have a slaty blue undercolour.

THE WYANDOTTE.

The Wyandotte is a rose-comb breed and is characterized as a breed of curves. The body is comparatively round and set somewhat lower on the legs than the Plymouth Rock. It is inclined to be a looser-feathered breed,

and its general shape and character of feathering gives it an appearance of being somewhat short backed and short bodied. The Wyandotte is a breed which also was developed in the United States, and has become very popular. The Silver Wyandotte was the original variety, and it is generally believed that the Dark Brahma the Silver-Spangled Hamburg, and the Buff Cochin played a part in its origin. It is somewhat smaller than the Plymouth Rock, the standard weight being, for the cock, 8½ pounds; hen, 6½ pounds; cockerel, 7½ pounds; pullet, 5½ pounds. The hens are fairly prolific layers of brown eggs, are reputed to be good winter layers, and the breed as a whole makes a fine table fowl. The young chickens do not tend to have the same leggy stage which is characteristic of the Rocks and most of the other general-purpose breeds, and the breed is therefore well suited for the production of broilers. Like the Plymouth Rock, all the varieties of this breed are yellow legged and yellow skinned, which adds to their market popularity.

In the Silver Wyandotte the male has a silver-white back and saddle, the hackle and saddle feathers being striped with black. The feathers of the body and breast are white, each laced with a black edge. The main tail feathers are black. The fluff is a slate colour with some gray mixture. The colour of the female shows white feathers laced with black over the entire body except the hackle, which is black laced with white, and the main tail feathers, which are black, and some black in the wings, while the fluff is slate mixed with gray. The colour combination and the character of markings of the Silver Wyandotte make this a very attractive variety.

In the Golden Wyandotte the general colour Scheme is the same as in the Silver Wyandotte, except that the white of the Silver variety is replaced with red and reddish brown. Like the Silver Wyandotte, the colour and markings of the Golden are very attractive.

The White Wyandotte is undoubtedly the most popular variety of this breed. The colour is white throughout, and should be free from any brassiness or creaminess or black ticking.

In the Buff Wyandotte the colours should be an even shade of buff throughout, being identical with that of the Buff Plymouth Rock.

In the Black Wyandotte the colour is black in all sections, showing a greenish sheen, free from purple barring. The undercolour is lighter, somewhat on the slate order.

In the Partridge Wyandotte the colour is the same as in the Partridge Plymouth Rock. In the Silver-Penciled and Columbian Wyandotte the colour is the same as in the corresponding varieties of the Plymouth Rocks.

THE JAVA.

The Java is one of the oldest breeds developed in the United States. In general this fowl tends to be long in body and broad in back. The comb is single, and the legs of the Black variety are black or black approaching yellow, while those of the Mottled variety are yellow and leaden blue. The colour of the legs detracts somewhat from the fowl for market purposes. The skin, however, is yellow. The hens are good layers of brown-shelled eggs, and the fowls are suitable for table purposes. This breed is not very commonly found at the present time. The standard weights are: Cock, 9½ pounds; hen, 7½ pounds; cockerel, 8 pounds; pullet, 6½ pounds.

There are two varieties of Javas, the Black and the Mottled. The colour of the Black Java is black throughout, with a greenish sheen on the surface plumage. Purple barring is undesirable. In the Mottled Java the plumage is a mottled black and white throughout, the black being more plentiful than the white. The undercolour of the Mottled Java is slaty.

THE DOMINIQUE.

The Dominique is also one of the oldest of the American breeds. The Dominique colour is associated in the minds of people throughout the country with the barnyard fowl and is frequently confused with the Barred Plymouth Rock colour. The Dominique is somewhat smaller and somewhat slighter in body, with a tail somewhat longer and sickles more prominent, than the other American breeds. This breed has a rose comb and yellow legs and skin. The hens lay brown-shelled eggs and are good table fowls, although somewhat smaller than the other general-purpose breeds. The standard weights for this breed are: Cock, 7 pounds; hen, 5 pounds; cockerel, 6 pounds; pullet, 4 pounds. The pure-bred Dominique is not extensively kept at the present time in the United States.

In colour of plumage the Dominique has a general bluish or slaty cast, the feathers in all sections being barred throughout with alternate, rather irregular, dark and light bars. The markings somewhat resemble those of the Barred Plymouth Rock, but are less distinct, and lack the clean-cut character of the Plymouth Rock barring. Like the Barred Plymouth Rock, each feather should end with a dark tip. The Dominique male may be, and often is, one or two shades lighter than the female. Slate undercolour occurs throughout.

THE RHODE ISLAND RED.

The Rhode Island Red is one of the newer breeds which have been developed in this country. At the present time it bears an excellent reputation among the farmers and is kept very extensively throughout the farming districts. The breed originated in Rhode Island, where it was developed by the farmers engaged in poultry raising. The Malay, Buff Cochin, Buff Leghorn, and Wyandotte are said to have been used in its development.

In type the Rhode Island Red has a rather long, rectangular body and is somewhat rangier in appearance than the Plymouth Rock or the Wyandotte. The hens are prolific layers of brown-shelled eggs, and the breed makes a very suitable table fowl, having yellow legs and yellow skin. The Rhode Island Reds have enjoyed an excellent reputation for hardiness, which in the main, they have well deserved. The standard weights for this breed are: Cock, $8\frac{1}{2}$ pounds; hen, $6\frac{1}{2}$ pounds; cockerel, $7\frac{1}{2}$ pounds; pullet, 5 pounds.

There are two varieties of the Rhode Island Red which are identical in colour and type, but one of which has a single comb and the other a rose comb.

In colour the Rhode Island Red is a rich, dark red, approaching a mahogany. It is desired to have this colour as even as possible over the entire surface. There is a tendency, however, for the hackle and the lower part of the saddle of the male to be lighter in colour than the back and shoulders. The main tail feathers in both sexes are black and the wings also show some black. In the hackle of the female there is also a slight ticking of black. The undercolour of all sections should be red, and free from a dark or slaty appearance, which is known as smut.

THE RHODE ISLAND WHITE.

The Rose-Comb Rhode Island White has recently been admitted to the American class. The type and other characteristics are identical with the Rose-Comb Rhode Island Red, except that the plumage should be of pure white colour, free from any tint of brassiness. This variety was before the public a number of years before it was admitted to the American Standard.

It has the desirable qualities of a general-purpose breed found in the Rhode Island Red. Good type is essential, as otherwise specimens of this breed may be mistaken for White Wyandottes.

THE BUCKEYE.

The Buckeyes are an American breed of comparatively recent origin. In type they approach somewhat to the Cornish, being erect and broad; breasted. The standard weights are:—Cock, 9 pounds; hen, 6½ pounds-cockerel, 8 pounds; pullet, 5½ pounds. This breed has a pea comb, which doubtless comes from the Cornish blood used in originating it. The hens lay brown eggs. In colour Buckeyes are mahogany bay, which is slightly darker on the wing bows of the males. The flight and tail feathers often carry black as well. The undercolour should be red, except in the back, where a bar of slate is desired.

THE JERSEY BLACK GIANT.

The Jersey Black Giant recently admitted to the Standard, is the largest of American breeds. Though usually regarded as meat fowls, they are good layers of brown eggs and resemble the other general-purpose fowls in most of their characters. They are especially good rustlers, considering their size.

This breed originated on the farms of New Jersey, where capons were produced in large numbers for the Philadelphia market. Size and stamina are requisites for stock used for this purpose. The breed was produced as the result of crossing the Black Langshan, Black Java, Dark Brahma, and Partridge Cochin.

The colour of plumage, shanks, and feet and the head points of this bird are similar to those of the Black Java, but the type resembles particularly that of the Plymouth Rock and also approaches that of the Rhode Island Red. The Jersey Black Giant is, however, a much broader, deeper, and longer bird than either of the last two. The plumage in all sections is a rich black with a greenish sheen. The undercolour is lighter, approaching white at the skin. This breed has a single comb and black shanks with yellow on the under surface of the feet and toes.

Standard weights for the breed are : Cock, 13 pounds ; hen, 10 pounds ; cockerel, 11 pounds ; pullet, 8 pounds.

The size and yellow skin make the Jersey Black Giant a very attractive market fowl except for the objectionable black shanks.

THE CHANTECLER.

The Chantecler, which is a recent addition to the Standard, originated in Canada, and is especially adapted to extreme northern sections because of its small comb and wattles and its heavy, closely feathered plumage, which enable it to withstand cold weather. The comb and wattles, on account of their small size, are not likely to become frozen.

The most noticeable characteristics of the breed are a conformation resembling that of the Cornish, especially in breast development and carriage, and the smallness of the cushion-shaped comb and the wattles. The Cornish, White Leghorn, White Wyandotte, Rhode Island Red, and White Plymouth Rock were used in producing the new breed. This stock has produced a general-purpose breed showing greater length of body than the Cornish and having better egg production than is usually found in that breed. The yellow skin and shanks, combined with good size, make the Chantecler attractive as a market fowl. The breed produces a brown egg, the same as the other general-purpose breeds of the American class.

The standard weights are : Cock, 9 pounds ; hen, 7 pounds ; cockerel, 7 pounds ; pullet, 6½ pounds.—FARMERS' BULL. No. 1347 of U.S. Dept. of Agric.

CO-OPERATION.

THE LAND AND AGRICULTURAL BANK OF SOUTH AFRICA.

The year 1922 is looked upon in South Africa as having been the worst year for the farming community for two decades. Great ravages were caused among crops and stock by disease, drought, locusts, and hail; at the same time, owing to the slump in the value of produce, prices were very low. These facts combined caused such heavy losses to farmers that it was feared that many would be obliged to leave their farms to seek other means of livelihood; events showed, however, that it was only in isolated cases that debtors left their farms to take up other work.

A Parliamentary grant of £500,000 was made to the Land and Agricultural Bank in 1922 to enable it to continue to make advances during the year. In spite of this the Bank was still compelled to restrict its operations in certain respects—advances were not made purely to redeem existing bonds, nor to enable persons owing sufficient land to purchase other land nor to persons who carry on any business other than farming unless they permanently reside on their farms, and unless farming is their main business.

The number of applications for ordinary loans received by the Bank in 1922 was 3,554 for a total amount of £2,062,677, as against 2,647 applications for a total of £1,499,871 in 1921. The number of applications granted by the Bank during 1922 was 2,700 for a total amount of £1,286,468.

During the year the Bank made advances amounting to £1,092,870. The purposes for which they were granted are shown in the following table:—

Purposes for which Advances were made by the Land and Agricultural Bank during the year ended 31st December, 1922.

Province	Improvements	Purchase of Stock	Discharge of Liabilities	Purchase of Land		Total
				By persons owning no land	By persons owning insufficient land	
	£	£	£	£	£	£
Transvaal	119,606	69,163	241,965	120,773	63,388	614,895
Orange Free State	28,760	12,902	104,618	69,145	23,250	238,675
Natal	18,312	9,398	25,186	22,416	11,583	86,895
Cape	29,598	8,753	71,596	28,685	13,773	152,405
Total	£196,276	100,216	443,365	241,019	111,994	1,092,870

During 1922 the Bank received 645 applications for fencing advances for a total amount of £160,329. Of these, 449 applications. representing £100,560, were approved, 22 were withdrawn and the remainder were pending. The advances approved averaged £50 per mile of fencing proposed. The fencing advances paid out during the year amounted to £59,730. The number of applications for vermin-proof fencing is increasing rapidly, particularly as a result of Act No. 11 of 1922 which makes contributions to this type of fencing compulsory in areas where the majority of farmers desire it. The provisions of the Fencing Act No. 17 of 1912, have been extended by Act No. 40 of 1922 to include the fencing of public roads.

The applications for advances for the erection of dipping-tanks numbered 262 for a total amount of £33,169. Of these, 213 applications representing £27,267 were already approved before the end of the year, the average per tank being £128. The amount paid out by the Bank during the year in respect of dipping-tanks was £31,603, of which £1,000 was for tanks in native areas.

Up to the end of 1922 no advances had been made under the special provisions of Section 16 of Act No. 36 of 1921 for the construction of silos. The reason is, not that provision for these advances is unnecessary, but that. owing to the difficulties with which they have been beset, farmers have not cared to incur expenditure which could be avoided.

Co-operative agricultural societies applied during the year for advances amounting to £609,470 ; of this sum £601,970 was granted. The loans to co-operative societies outstanding at the end of the year totalled £750,565.

The amount still owing to the Bank by farmers in certain areas of the Cape Midlands, in respect of loans amounting to £50,538 granted after the drought and floods of 1916, was £1,030 on 1st January, 1922. During the year this was reduced to £220 and has since been further reduced to £121. It is hoped that during 1923 these accounts will be finally closed.

Under Section 20 of Act No. 33 of 1909 of the Orange Free State, advances were made by the Land and Agricultural Loan Fund of the Orange Free State to applicants who were unable to furnish the security of first mortgage of land, a total amount of £124,555 being advanced to 884 debtors. When the provincial banks were absorbed by the Land and Agricultural Bank in October, 1912 there was £105,960 still owing ; this has now being reduced to £2,258, in respect of 40 debtors. These advances have been of special help to the sons of farmers who owned their farms.

There is a large number of farmers in the Union who, although they especially have suffered during the past few years, are precluded from State assistance by the fact that they are not landowners. It has been suggested that there should be some form of State assistance to these tenant farmers to provide for their needs until they are in a position to acquire their own land and qualify for advances from the Land Bank. The Bank considers that a co-operative scheme is the best method of assisting these men, and accordingly proposes that farmers should group themselves into small societies of about 50 members with unlimited liabilty. These societies would be the medium through which tenant farmers could be assisted.

Although the Land Bank Act had been amended in 1921 by Act No. 36 of 1921, further amendments were made in 1922. These amendments made by Act No. 40 of 1922, provide for advances to companies with limited liability, and empower the Bank to accept money on deposit for the purpose of providing for the seasonal requirements of Co-operative societies and companies. Under the terms of these amending Acts the Bank has power to raise money by discounting with other banks bills of co-operative societies and companies, by obtaining overdrafts from other banks, by issuing Land Bank bills, and by receiving money on deposit. So far the Bank has not had occasion to discount bills of societies since an overdraft on reasonable terms forms the most satisfactory means of financing the seasonable requirements of co-operative societies. Furthermore, the special powers of raising money by means of deposits have not been used to any appreciable extent. When, however, the Bank is called upon to finance other produce, such as wool and mohair, short-date credit will be required continuously throughout the year and the whole position will then have to be reconsidered.—F. L. T.—INTERNATIONAL REVIEW OF AGRIC. ECONOMICS, Year I., No. 3.

CO-OPERATION MEANS MUTUAL AID.

The life-infusing force of the co-operative movement is the spirit of mutual aid. Agricultural co-operation the world over is rooted in economic necessity; it develops from a real need for mutual aid, and though a product of hard, cold realism it is not without a palpitating idealism—the true co-operative spirit without which the movement would be as a husk without corn. Queenslanders have no need to look beyond the borders of their own State for outstanding examples of co-operative success. In the dairying industry alone co-operative progress has been phenomenal. Co-operative principles are being extended to other branches of the farming industry and further extensions are planned. The need for united effort, the primary factor, is already sharply felt in every section of the industry, but there are other essentials which the co-operating farmer must also take into account. Some business must be the basis of any new organisation. It must be competently directed by men who mean business and who understand business; its members must be taken into the confidence of its directorate; they must fully realise the aims, possibilities, obstacles and responsibilities, individually and collectively, that pertain to undertaking. Experience teaches that each and every co-operator should have a clear and complete knowledge of the principles of co-operation. Co-operative success is otherwise bound up in sufficient business; faith in the co-operative idea; existence of the real spirit of mutual help; adequate capital; sound accountancy; loyalty; leadership—and managerial brains at least equal in quality to the brains of the entrenched interests that co-operators will have to fight.—QUEENSLAND AGRIC. JOURN., Vol. XX., Pt. 4.

GENERAL.

INDUSTRIAL SHOW AND PADDY AND VEGETABLE GARDEN COMPETITIONS IN TRINCOMALIE.

In connection with the Industrial Show proposed to be held at Trincomalie on 31st March, 1924, it has been decided to adopt the same rules as were passed for the show held last year, which includes that all exhibits entered for competition should be grown, bred, or made in the Trincomalie District by the competitors. The prizes are to consist mostly of cash of not less than Rs. 2 each in addition to the certificates awarded. Each variety exhibited is to be awarded a prize.

The exhibition is to be divided into four sections, viz. Section I—vegetables; Section II—grains and pulses; Section III—fruits; Section IV—industries.

PADDY COMPETITION.

It has been decided that the competition for the Pinmari cultivation should be open to the whole of Trincomalie District and that the judging of the plots should take place by the end of July, 1924, for which the following prizes have been offered :—

1st Prize	...	Rs. 50·00
2nd Prize	...	Rs. 30·00
3rd Prize	...	Rs. 15·00

Under the rules the area to be sown is to be not less than 3 acres, and the age of the paddy sown should not be less than three months, the competitors being only *bona fide* cultivators. In awarding points to competitors notice will be taken of improved methods adopted such as manuring, weeding and transplanting.

VEGETABLE GARDEN COMPETITION.

An extent of not less than ½ an acre to be cultivated with six varieties of vegetables including peas and beans, for which the following prizes are to be awarded :—

1st Prize	...	Rs. 50·00
2nd Prize	...	Rs. 30·00
3rd Prize	...	Rs. 15·00

PADDY AND GARDEN CULTIVATION COMPETITIONS IN RATNAPURA DISTRICT 1922-23.

Under the auspices of the Ratnapura District Food Production Committee, paddy and garden competitions were held during the year 1922-23, and the following is a list of those who have been awarded prizes. In addition to the money prize a certificate was also given to each of the successful competitors :—

PADDY CULTIVATION COMPETITIONS.

Kuruwiti Korale.

1	Kalawane Vidanalage Siribohamy of Watuyaya ..	Rs. 20·00
2	Manamperi Mudiyanselage Lokumahatmaya of Walandure ...	,, 10·00
2	Hapuarachi Vidanalage Serahamy of Walandure ...	,, 10·00
3	T. D. de Silva of Weralupe ...	,, 5·00

Nawadun Korale.

1	P. A. W. Mudalihamy of Denaweka, Udakada ..	,, 20·00
2	K. Punchappuhamy of Denaweka, Udakada ...	,, 10·00
3	Mahara Appuhamy of Kammaramgapitiya ..	, 5·00

Kukulu Korale.

1	G. Allisa of Galature ...	,, 20·00
2	W. Karolis Fonseka of Galature ...	,, 10·00

Kadawata and Meda Korales.

1	Ampitiyewatte Kirisantha of Massenna ...	,, 20·00
2	Ratnayakage Ukkurala of Massenikanda ...	,, 10·00

GARDEN CULTIVATION COMPETITION.

Kuruwiti Korale.

1	Hewawasam Puwakpitiyege Jornis Singho of Higgashena ...	,, 20·00
2	M. M. Podi Nilame of Kandangoda ...	,, 10·00
3	K. Pina Gan Arachchi of Gilimale South ...	,, 5·00

Kukulu Korale.

1	Samarasingha Arachchilage Herathamy of Weddagala ...	,, 20·00

Atakalan Korale.

1	M. C. Charles Appuhamy of Madalagama ...	,, 25·00
2	No recommendation	...
3	M. W. Ran Banda of Balawinna ...	,, 5·00

Kadawata and Meda Korales.

1	Singho Rodrigo Appuhamy of Weligepola ...	,, 20·00
2	Nallaperuma Arachchilage James Appu of Horakanwala ...	,, 10·00

VEGETABLE GARDEN COMPETITIONS IN MATALE SOUTH DURING 1923.

A garden Competition was organised for Matale South to be held during the year 1923. The object of the above competitions was to encourage *bona fide* villagers to adopt the cultivation of food stuffs on their lands. It was decided to award two first and second prizes of Rs. 50/- and Rs. 25/- respectively ; the divisions being divided according to importance into two divisions viz :—

(a) Kehensiya, Madasiya and Udasiya Pattus and

(b) Gampahasiya, Asgiri Udasiya and Pallesiaya Pattus.

Lists of registered plots were collected by the Ratemahatmayas Matale South and the Agricultural Instructor in good time.

Nearly 100 cultivators competed for the prizes at the start but this number later decreased to about 60, others having abandoned their plots owing to the unusual delay of the monsoon rains.

In the divisions indicated by (B) above, only the first prize was awarded. We did not recommend a second prize as the remaining plots were not up to the requirements and therefore we decided to recommend the second prize to the third best competitor in the (A) divisions as competition in this area was very keen. The winner of the first prize in (B) division is fully deserving of it as he has taken a lot of trouble in preparing his garden and making it productive.

On the whole the tempting prizes offered had resulted in a larger increase in food stuffs cultivated within the division, than it would have been otherwise.

First judging was carried out during the month of May 1923, and second judging was completed during July. During the second judging four plots in (A) and 2 in (B) were selected for the final judging. The final judging was completed during the first week of September and after careful consideration the following were decided upon as the deserving prize-winners :—

(A) 1st prize to Oyagawage Weerappu of Padivita Wasama.
2nd prize to T. B. Arawwawela of Nugapitiya Wasama.

(B) 1st prize to N. B. D. Giragama of Udugama,
2nd prize to Sahul Hamidu, Arachchi of Warakamure (in A Division)

Judges : (Sgd.) WALTER A. UDUGAMA,
Ratemahatmaya, Matale South,
(Sgd.) GRATIÆN DE SILVA,
Agricultural Instructor, Matale.

NOTE ON CASUARINA PLANTING.

E. P. POPART,

Conservator of Forests, Central Circle, Madras.

The varying and in some districts apparently excessive cost of casuarina plantations induced me to call for information from all districts in the circle in which casuarina is planted. District Forest-officers were asked in December 1893 to furnish the following information:—

(1) Average yield per acre, age at which felled and net revenue.

(2) Usual date of formation of nurseries with cost of (*a*) preparation (*b*) watering, (*c*) permanent and temporary establishment per mensem, and (*d*) rate of wages paid for coolies with number of months employed.

(This information to be reduced to show the cost per acre of plantation.)

(3) Cost per acre of planting out, including (*a*) sinking and cleaning wells with number per acre, (*b*) digging pits for seedlings, (*c*) planting out, (*d*) watering, (*e*) replanting casualties and (*f*) establishment, permanent or temporary.

(4) With regard to the charges for 3 (*d*) watering, (i) number of years usually watered and number of months in each year, (ii) cost during first year, second year, and (iii) number of seedlings a cooly is supposed to water per diem and the number of times watered each month.

2. The information has been furnished more or less. It has naturally taken some time to tabulate as old returns had to be examined. That from Chingleput is particularly incomplete and unreliable. No attempt had been made in Trichinopoly to record the yield per acre. It is evident, and to be regretted, that in these districts in the old days sufficient interest was not taken to check the work. It is not to be wondered at if the cost has been high. No branch of forest cultural operations lends itself more readily to cheating by subordinates.

3. The following is a summary of the information received, omitting Chingleput, which is not worth tabulating:—

(*a*) *Average age of felling.*—The average age of felling is ten years.

(*b*) *Outturn per acre.*—The average outturn ranges between 50 tons in Nellore and 28 in North Arcot. The plantations in North Arcot are situated some distance from the coast, have less moisture and are altogether less favourably placed. It is intelligible that the growth is slower.

(*c*) *Cost of nurseries.*—The seed is sown in nurseries in Nellore, North and South Arcot about February, in Tanjore not until June and in Trichinopoly at various times. There is no reason for delaying the sowing in Tanjore until June, and in future the practice in other districts should be followed. Trichinopoly is somewhat different; as the padugais are liable to flooding during the rains, the formation of the nurseries has to be deferred. The cost of nurseries differs very materially and cannot be accounted for by difference in the rate of wages paid to coolies. In Nellore the cost of nursery for one acre of plantation amounted to 9 annas 1 pie. In Tanjore it would appear the cost has been Rs. 5 per acre. In South Arcot it is shown as Rs. 2-5-7. It is impossible to gather from the North Arcot statement the cost reduced to an acre of plantation, but the cost per acre of nursery is given as Rs. 140. The area this nursery is supposed to provide with plants is not given.

(*d*) *Cost per acre of planting.*—(i) *The cost of putting* in Nellore and Tanjore amounted to 6 annas per 1,000 plants, in South Arcot to 6 annas per acre and in Trichinopoly is put down at Re 1-1-6 per acre. There is ample scope for reduction in the last-named district. (ii) *The cost of planting* out the seedlings in Nellore and Tanjore was practically the same, 4 annas

and five pies per acre. In South Arcot, inclusive of watering while planting it, amounted to one rupee per acre; the higher rate in this district compared with Nellore is due to the larger number of plants put out—1,210 per acre instead of 540. In Trichinopoly however the cost of planting out 1,210 seedlings is shown as Rs 3-6-0 per acre. In future I think 9ft. × 9 ft. may be adopted, as a rule for the distance when planting, and the cost, I consider, should not exceed 6 annas.

(*e*) *Cost of watering*—(i) *Wells.*—The cost of sinking wells varied from 4 annas per well in Nellore and Trichinopoly to 14 annas in Tanjore. This naturally depends upon the soil and the depth of the water level below the surface. The number of wells per acre ranged from three-fourths of a well per acre in Nellore to two in Tanjore. It is not advisable to stint the number of wells, their cost is trifling and it must be borne in mind the nearer the wells the greater the number of plants a cooly can water per diem.

(ii) *Number of plants watered per diem by one cooly*—In Nellore a cooly watered 1,000 plants per diem, giving each plant half of a large chatty. In Tanjore the same number of plants was watered twice a day, each plant receiving two-thirds of a chatty. In South Arcot the number varied from 600 to 800 plants. In North Arcot a female cooly watered 150 to 200 plants, giving each plant one whole chatty, and in Trichinopoly only 135 plants. There is no doubt the figures in the last district do not represent a fair day's work, and there is no reason for the average being below that of other districts. With three wells to the acre a male cooly should water at least 600 plants per diem.

(iii) *Length of time watered.*—In Nellore it was the practice to water the seedlings for 4 years. In the first year the plants were watered daily from time of putting out (September and October) until May after which the number of coolies employed depended upon the intensity of the south-west monsoon and the site of the plantation; on high sand banks daily watering was undertaken until the north-east monsoon. The second year watering was conducted from February to May and in August and September. The third year watering was confined to the months March to May and August and September, the same during the fourth year. The cost amounted to Rs. 41-14-4 per acre. In North Arcot it was the custom to water for three years throughout. In South Arcot, as a rule, plants were watered for six months in the first year, four or five in the second and occasionally during unfavourable seasons for some time in the third year. The cost for two years' watering amounted to Rs. 26. In Tanjore plants have been watered for four months in the first year, eight in the second, six months in the third and two months in the fourth, and the cost has been Rs. 58 per acre. In Trichinopoly, watering was supposed to be carried on for eight months in the first year, six months in the second and three months in the third. The plants were only watered from four to six times per mensem, yet the cost of watering amounted to Rs. 96-2-6 per acre. It is certain that the watering charges in some of the districts were excessive and no reason can be assigned for the excess. I feel convinced that under ordinary circumstances, except in North Arcot, it is seldom necessary to water regularly for more than two years, though it may be found advisable to water parts of plantations during the third year. Even in North Arcot it is decidedly unnecessary to water regularly for the whole three years.

(*f*) *Establishments.*—In some districts the permanent establishment undertook the supervision of plantations, in others temporary overseers were entertained. These charges cannot well be compared as they depend upon the strength and distribution of the permanent establishment.

(*g*) *Total cost per acre until the plantations are virtually left to themselves exclusive of supervision charges.*—Nellore Rs. 42-14-0, North Arcot Rs. 45, South Arcot Rs. 32-6-0, Tanjore Rs. 68, Trichinopoly Rs. 108-11-6.

4. Since submission of these returns in every district it has been found possible to reduce the cost of these plantations. The following appears to me an extreme estimate of the cost per acre of a plantation on sandy soil on which the seedlings are put out 9 ft. × 9 ft. or 540 plants per acre :—

	Rs.	A.	P.
Nursery charges	0	9	0
Pitting	0	6	0
Planting out	0	6	0
Wells	2	0	0

Watering.

First year—

Two months daily watering 600 plants per diem at 2 annas per cooly $= \frac{540 \times 2 \times 2 \times 30}{600} = 108$ annas 6 12 0

Three months watering alternate days $= \frac{540}{600} \times \frac{30}{2} \times \frac{3}{1} \times \frac{2}{1} = 81$ annas 5 1 0

Three months watering every third day $= \frac{540}{600} \times \frac{30}{3} \times \frac{3}{1} \times \frac{2}{1} = 54$ annas 3 6 0

15 3

Second year—

Six months watering every third day $= \frac{540}{600} \times \frac{30}{3} \times \frac{6}{1} \times \frac{2}{1} = 108$ annas 6 12 0

Third year—

Four months watering every third day $= \frac{540}{600} \times \frac{30}{3} \times \frac{4}{1} \times \frac{2}{1} = 72$ annas 4 8 0

	29	12	0
Add 10 per cent. for contingencies, or say ...	3	4	0
	33	0	0

5. From previous experience it should be safe to estimate that a plantation, except in North Arcot, will yield after ten years 40 tons per acre. The revenue after deducting felling and removal charges will certainly amount to Rs. 3 per ton = ... Rs. 120

Deduct.—

Cost of planting	Rs.	33
Interest at 5 per cent, for ten years, say ...	,,	16
Establishment charges, say 10 per cent, for ten years	,,	33
		82
Total net revenue	Rs.	38

Or Rs. 3¾ per acre per annum.

In districts like North Arcot, the estimated outturn will probably not be realized; on the other hand, however, it is certain the revenue will exceed Rs. 3 per ton and the net revenue should not fall below my estimate.

Leaflet No. 1 of Dept. of Land Revenue, Madras Forest Branch.

THE MESQUITE (*PROSOPIS JULIFLORA*).

W. ROBERTSON BROWN,

Agricultural Officer, N. W. Frontier Province.

In the March (1923) Number of the Agricultural Journal of India DR. K KUNHIKANNAN brought this useful sub-tree to the notice of the Indian farmer. My first acquaintance with it was in 1905 at Lahore, where its remarkable resistance to drought was already fully appreciated by the Superintendent of the Agri-horticultural Gardens, and it was being successfully employed to clothe red sun-baked brick-kiln mounds in the gardens and around the city. Since then I have seen the mesquite at many places between Cawnpore and the Khyber, also in South Africa, and no matter how hot the position, the tree has invariably been vigorous and bountiful of fruit. At the Peshawar Agricultural Station, where the mercury frequently exceeds 120°F., in the burning summer days, and falls to 26°F. in the cold season, where the average annual rainfall is about 13 inches only, a trial was started in 1911 to determine the economic value of the tree as food for stock, for fuel, and in clothing dry waste land. With no attention whatever since the plants were set out, the mesquite has flourished exceedingly and borne heavy crops of beans. The results of the observations at the station may be briefly stated as follows :—

Food for stock.—Well-fed sheep and goats readily eat the ripe beans under the trees, but take them sparingly from the crib. Cattle or horses in good condition do not eat the beans. Neither sheep, goats, cattle, horses, nor even camels willingly eat the mesquite leaves.

Fuel.—No tree grows more rapidly than the mesquite on arid land, or yields more fuel thereon in a shorter space of time. The wood burns well.

Clothing arid land.—To convert bare, drought-stricken yet fertile land in the N.W. Province into open wood-land, it is only necessary to establish a few groups of mesquite trees on the tract, and to leave the work of distribution to the sheep and goats which eat the beans but not the plants. To clothe dry sun-stricken ravine land, or to embellish slopes or banks, no shrub or plant of any kind known to me can compare with the mesquite in persistent vigour and delicate beauty. From the beginning of April, when the pendulous sprays of graceful feathery foliage and honey-coloured tassels of blossom unfold, until late November when, for the second time in the year, the branches of the trees bend with their load of nourishing beans, few of the great family of Acacias are more pleasing than the mesquite. By the roaside in desert tracts, where the *Kikar* (*Acacia arabica*) the *ber* (*Zizyphus jujuba*), the *phulai* (*Acacia modestas*, and even the *jhand* (*Prosopis spicigera*) do not survive, the mesquite can be established in belts or plantations. In the past few years, officers who have been studying at the Peshawar station with a view to farming abroad, have been impressed by the beauty and usefulness of the mesquite, and numerous parcels of seed have been sent to them in Africa and Australia.

When on an agricultural tour in South Africa in 1921, I was invited to visit some farms on the Karroo—that vast dry tract of heathery scrub whereon, in the frequent visitations of drought, hundreds of thousands of

the Merino lambs have to be sacrificed at birth to save the famished ewes from death—and to think of any drought-resistant shrub or tree which might help to tide over the periods of pasture famine. As the homestead of the first Karroo farm was approached, almost the first trees to come in my view were mesquite. An eager inquiry revealed the fact the trees had been planted by an officer of the Indian Irrigation Service who had been engaged in the construction of a dam near the farm, and had procured the seeds from the Punjab. I was informed that the sheep ate the beans greedily, and that by their agency seedlings were springing up far over the land. The farm manager only feared that the mesquite might become too aggressive. I determined to find by actual experiment in India the extent to which seedling mesquites might be expected to germinate from the dung of sheep not specially fed on mesquite beans, but which had picked up the beans in the course of their daily wandering over stubble, on pasture, or under the mesquite trees. On 6th September, 1921, 10 seed-beds, each measuring 8 square yards, were sown with the dung of the Peshawar station sheep which have access to mesquite trees. The dung was over six months old, and it is noteworthy that it had not been consolidated. It is the practice at the Peshawar station to sweep the pens and remove the droppings almost daily. The beds were irrigated and within five days fully 300 mesquite seedlings sprang up in each small bed. When the plants were 4 inches high and less than a month old, the roots of some of them were found to be over 4 feet long. To gain information on a field scale, a border, half a mile long and 12 feet wide, was next manured with the sheep dung. Seven days after irrigation was given—within seven days of spreading the dung—thousands of seedlings germinated throughout the length of the border. The results of these tests were published in the *South African Journal of Agriculture* (January 1923). Clearly then, sheep eat mesquite beans and the voided seeds germinate readily when the land is moist. To establish the mesquite on any dry tract or ravine land between Cawnpore and Peshawar, it is only necessary to sow small nucleus areas here and there, after rain has fallen in the month of August or September, or perhaps even in the early spring, and to let the plants fight their way to fruitfulness, after which the sheep and goats may be depended on to clothe the land with this valuable famine fodder. Although the germination of the seeds is most surely attained by feeding the beans to sheep, excellent results may also be got by pouring boiling water over the seeds in the evening and letting them steep till they are sown on the following day. Beans or seeds of the mesquite can probably be supplied by the Government gardens in North-West India. The Crop at Peshawar is being employed in sowing bare ravine land in the province.—AGRIC JOURN. OF INDIA, Vol. XVIII., Pt. VI.

ROOT PRUNING.

W. AUTON.

Pyrford Court Gardens, Woking.

Root pruning is a practice about which there is considerable controversy, but under certain conditions it may prove of the greatest value in changing the disposition of over-luxuriant trees to form wood growth into a disposition to form fruit buds.

It does not always ensure the ends for which it is resorted to. In some instances the wrong time is chosen for the operation, in others it is conducted in an injurious manner, while not infrequently it is adopted without

sufficient reason in direct opposition to the old adage "let well alone." In all cases where fruit trees are making a fair promise of fruitfulness, root pruning should not be undertaken, as it is more likely to prove harmful than beneficial. It does happen sometimes, however, that in places where the climate is eminently favourable to fruit production the trees make an excessive amount of growth, and in such cases judicious root pruning may bring them to a bearing state.

The season for root pruning should not be deferred until after the fall of the leaf; a better time for the operation is as soon as the growth of the season is completed and while the trees still retain their foliage. Several advantages accrue from carrying out the work during late September and October, and completing it before the fall of the leaf. In the first place any check given now will tend to the ripening of buds already formed, but which might start into growth and be lost in the event of the autumn proving warm and moist. Further, the soil is now sufficiently warm to promote a speedy healing of the wounds the pruning will occasion and the production of surface fibres from the cut ends of the fleshy roots, these fibrous roots being the very aid that the trees require to induce a condition of fruitfulness. Finally, it is usually much easier to carry out the work now than later when unfavourable weather conditions may cause weeks or months to elapse before an opportunity occurs.

It should be remembered that the principal object of the pruner should be to discourage the formation of deep tap roots, which go far down into cold clay or wet gravel, and encourage the formation of an abundance of surface fibrous roots that will always be benefitted by the influence of light and air. It should therefore be clearly understood that hacking and chopping of the roots is not to be desired. Clean cuts heal quickly and the roots when healed soon develop fibres, while bruised roots die back and foster disease. Such roots, therefore, as are injured by the spade should be trimmed cleanly by means of a sharp knife.

It is usually good practice to prune the roots on one side of the tree only in the one year, and to complete the work on the other side the next. In any case a trench should be opened at a sufficient distance from the tree to leave untouched a large mass of soil immediately surrounding the stem. When the thick and far-extending roots have been cut through all the prunings should be carefully collected and removed. In the process of filling up the trench good, turfy loam with a liberal addition of lime rubble and coarse bone-meal should be used, to encourage the production of a dense mass of fibrous roots.

It is a common mistake to suppose that a poor soil is the best to use in place of that taken out of the trench, the error being founded on the consideration that excessive luxuriance implies the existence of an excess of nourishment in the soil, whereas it may imply a deficiency of suitable food for the production of fruit and an excess of that required for the growth of stem and branch. Frequently trees grow freely in a wet soil, and in many cases where fruit trees make much growth and bear little fruit drainage may be needed much more than root pruning. Those contemplating planting fruit trees this autumn where the soil is known to be of a wet nature would do well to plant on slight mounds. This is often done with a view to restricting wood growth and inducing fruitfulness.—GARDENERS' CHRONICLE, VOL. LXXIV, No. 1917.

TROPICAL AGRICULTURE.

The Governing Body of the Imperial College of Tropical Agriculture, realising the need for the provision of scientists and technologists if the sugar industry of the British Empire is to be developed and our dependence on foreign countries for our sugar supplies obviated are establishing and equipping at St. Augustine, Trinidad, a model sugar factory towards which the British Sugar Machinery Manufacturers are contributing plant to the value of £20,000.

It is expected that the Factory will be completed next year, and meanwhile the Governing Body have appointed MR. E. C. FREELAND to be Professor of Sugar Technology, and MR. P. E. TURNER to be his Assistant and Demonstrator. MR. FREELAND was trained at the Louisiana Sugar Experiment Station and took the degree of B. S. at the Audubon Sugar School in 1918, MR. TURNER was educated at University College, Reading, and took an honours degree (London) in Chemistry in 1922.

Other recent appointments to the College have been those of MR. C. L. WITHYCOMBE and MR. E. E. CHEESMAN, who have been appointed Demonstrators in Zoology and Entomology, and Botany respectively. MR. WITHYCOMBE obtained the degree of B.Sc. in Chemistry, Botany and Zoology at King's College, Strand in 1921 ; M.Sc. in Zoology in 1922 and Ph. D. in 1923, while MR. CHEESMAN graduated at the University of London taking the First Class B.Sc. degree, with 2nd Class honours in Botany, in 1921.

THE BEST POSITION TO PLACE COCONUTS IN THE NURSERY.

The Editor, TROPICAL AGRICULTURIST.

SIR,—From the very remote times it had been the practice in some countries to place the nuts in nurseries in vertical position with stalk end pointing upwards and this is the practice that was followed by the old Jesuit planters in India (cf. *Arte Palmarica*, a book about two centuries old). Quite recently, however, the advisability of this mode of planting has been seriously contested by scientists who favour the horizontal or oblique planting with acute end pointing downwards. This view has received support from experiments made on some experimental stations and also from men like Prudhomme, Copeland, Preuss, Barret, Wester, Munro and Brown, Smith and Pape, and Sampson who have written treatises on coconuts. The tendency among the modern planters is also to support this view. It will be of great interest, therefore, if MR. RAJAPAKSE would supply any available data on which he based his following statement :

"Some think it (a nut in the nursery, should be placed horizontally as it is the natural position but experience has proved the upright position to be better and more convenient for planting." (TROPICAL AGRICULTURIST, Sept. 1923, p 166).

I take this opportunity to suggest that the planters who have the opportunity of sowing the nuts should try to test the superiority of any of these methods not only as regards the germination of the nuts but also with regard to the performance of these seedlings in their permanent place.

Yours faithfully,

C. X. FURTADO.

20-XI-23.

MARKET RATES.

MARKET RATES FOR SOME TROPICAL PRODUCTS.

(FROM LEWIS & PEAT'S, Ltd., MONTHLY PRICES CURRENT OF 5th DECEMBER, 1923, LONDON).

GOODS	QUALITY	PRICE	PER	Pkgs.	POSITION	MARKET
COPRA—						
" ...	Ceylon ...	£ 31/10	ton	Bags	C.i.f, U.K.	Very Firm
" ...	Malabar ...	Nominal	"	"	" "	"
	Straits [F.M.S.] ...	£ 30	"	"	" "	"
OILS—						
Coconut Oil ...	Ceylon ...	47/	cwt.	Casks	" "	Steady
" ...	Cochin ...	Nominal	"	"	" "	"
Palm Oil ...	Congo ...	£38	ton	"	Spot "	Firm
" ...	Lagos ...	£38 15/	"	"	" "	"
Palm Kernel Oil ...	Crushed ...	42/	cwt.	Naked	" "	Firm
PALM KERNELS—	West African ...	£20/10	ton	Bags	Ex quay L'pool / Spot U.K.	Very Firm
SEEDS—						
Castor Seed ...	Bombay ...	£26 10	ton	Bags	C.i.f U.K.	Very Firm and Scarce

COLOMBO.

(From Weekly Prices Current published by the Ceylon Chamber of Commerce dated 31st December, 1923).

	Rs. c.	@	Rs. c.
Cardamoms			
All round parcel well bleached - - -	per lb.	No Quotations available	
" " medium - - -	"		
Cnnamon Quills.—(At Buyer's Stores)			
Ordinary assortment (in bales of 100 lb. nett) - -	"	0 56	" 0 59
No. 1 - - - -	"	0 59	" 0 61
No. 2 - - - -	"	0 57	" 0 59
No. 3 - - - -	"	0 55	" 0 57
No. 4 - - - -	"	0 53	" 0 55
Cinnamon Chips.—Maradana (At Buyer's Stores) (in bags of 56 lb. nett) per candy of 560 lb. - -		55 00	" 60 00
Citronella Oil.—(ex Seller's Stores without Packages) -	"	2 05	" 2 10
Cacao.—(At Buyer's Stores)			
Estate—Finest - - -	per cwt.	40 00	" 50 00
" Medium - - -	"	30 00	" 45 00
" Common (Black) - - -	"	20 00	" 30 00
Coconut—(Desiccated.) Granulated goods (Delivered at Wharf or Buyer's Stores)			
Medium Fine			
Assortment 50% 50% - -	per lb.	0 22¼	" 0 23¼
Fibres.—(At Buyer's Stores)			
Coconut Bristle No. 1 - -	per cwt.	13 75	" 14 50
do " 2 - -	"		
Coconut Mattress No. 1 - -	"	2 70	" 3 00
do " 2 - -	"		
Coir Yarn, Kogalla No. 4 to 9 - -	"	13 00	" 22 00
do Colombo " 3 to 7 - -	"	13 00	" 15 50

ANIMAL DISEASE RETURN FOR THE MONTH ENDED 31st DECEMBER, 1923.

Province, &c.	Disease	No. of Cases up to date since Jan 1st, 1923	Fresh Cases	Recoveries	Deaths	Balance Ill	No. Shot
Western	Rinderpest	429	136	78	316	12	23
	Foot-and-mouth disease	3419	...	3382	37	—	—
	Anthrax	—	—	—	—	—	—
	Hæmorrhagic Septicæmia	2	—	—	2	—	—
	Rabies	1	—		—	—	1
Colombo Municipality	Rinderpest	606	223	—	—	—	—
	Foot-and mouth disease	87	—	85	2	—	—
	Anthrax	1	1	—	1	—	—
	Rabies	10	—	—	10	—	—
Cattle Quarantine Station	Rinderpest	31	—	16	15	—	—
	Foot-and-mouth disease	22	—	21	1	—	—
	Anthrax	193	11	—	193	—	—
Central	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	651	5	643	8	—	—
	Anthrax	11	5	—	11	—	—
	Piroplasmosis	1	—	1	—	—	—
	Rabies	2	—	—	2	—	—
Southern	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	1154	—	1133	21	—	—
	Anthrax	—	—	—	—	—	—
Northern	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	8	8	8	—	—	—
	Anthrax	—	—	—	—	—	—
Eastern	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	—	—	—	—	—	—
	Anthrax	—	—	—	—	—	—
	Surra	9	—	4	5	—	—
North-Western	Rinderpest	8	2	—	5	—	3
	Foot-and-mouth disease	982	—	960	22	—	—
	Anthrax	5	—	—	5	—	—
North-Central	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	158	—	158	—	—	—
	Anthrax	—	—	—	—	—	—
	Piroplasmosis	6	—	—	6	—	—
Uva	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	7	—	7	—	—	—
	Anthrax	—	—	—	—	—	—
	Piroplasmosis	3	—	1	2	—	—
	Hæmorrhagic Septicæmia	15	—	—	15	—	—
	Tuberculosis	1	1	—	—	—	1
	Rabies	1	—		—	—	1
Sabaragamuwa	Rinderpest	7	—	2	3	—	2
	Foot-and-mouth disease	2576	19	2518	23	33	2
	Anthrax	27	—	—	27	—	—
	Hæmorrhagic Septicæmia	12	—	—	12	—	—
	Rabies	3	—	—	—	—	3

Colombo, January 12, 1924.

G. W. STURGESS,
Government Veterinary Surgeon.

METEOROLOGICAL
DECEMBER, 1923.

Station	Temperature: Mean Daily Shade	Temperature: Difference from Average	Mean Humidity	Mean amount of Cloud 0=clear 10=overcast	Mean Wind Direction during Month	Daily Mean Velocity	Rainfall: Amount	Rainfall: No. of Rainy Days	Rainfall: Difference from Average
			%			Miles.	Inches		Inches
Colombo Observatory	79·0	0	82	7·0	N	106	9·02	17	+4·45
Puttalam	77·8	+0·2	85	6·1	NNE	139	9·52	15	+3·29
Mannar	78·2	-0·6	86	8·3	NNE	259	18·30	24	+10·54
Jaffna	77·4	-0·2	84	8·7	NE	87	21·25	23	+10·77
Trincomalee	78·0	-0·6	87	8·0	NE	229	24·16	28	+9·90
Batticaloa	78·0	0	80	7·2	NNE	209	28·13	28	+11·56
Hambantota	78·7	+0·1	84	5·2	NE	281	8·80	13	+3·42
Galle	78·5	+0·1	84	7·0	Var:	135	9·00	13	+2·36
Ratnapura	79·6	+0·2	80	6·4	—	—	8·35	19	-0·43
Anu'pura	76·4	-0·6	90	8·0	—	—	15·80	22	+6·96
Kurunegala	77·6	-0·4	82	7·2	—	—	12·38	15	+4·86
Kandy	74·6	+0·1	82	7·0	—	—	15·23	18	+6·23
Badulla	70·8	+0·2	88	8·2	—	—	21·79	25	+9·54
Diyatalawa	65·4	+0·4	86	8·0	—	—	12·15	23	+4·22
Hakgala	59·0	+1·0	92	8·4	—	—	18·46	28	+5·12
N.' Eliya	59·6	+1·8	84	7·4	—	—	12·40	23	+3·00

Rainfall in December was consistently above average. The highest totals occurred in the North and on the North-East shoulders of the main hill country, and these areas were also the ones in which the offsets above average were greatest. Among noteworthy figures were the following:—Sacumbe 52·23, Dooroomadella 49·07, Vangalachettykulam 47·46, Kobonella 47·42, Mankulam 45·56, Gammaduwa 45·50 inches.

The few stations that failed to reach their average included one or two in the Ratnapura district, and some in the middle of the Southern Province, but in none of these cases were the deficits large.

There was a good deal of depressional activity during the month though the use of the word "cyclone" was not strictly justified. This activity was well marked from the 11th to the 17th (particularly the 14th) and then, after a slight respite on the 18th and 19th, was even more in evidence on the 20th–22nd at which period a definite depression formed east of the island. Fortunately it followed a less westerly course than is usual at this time of year and so allowed much clearer weather over the X'mas holidays. Falls of six or seven inches in a day were far too numerous to mention them individually, but the following reports of over eight inches may be noted:—14th. Baduluwella 12·00, Kobonella 9·45. Medagama 8·87 Madugoda 8·65, 16th Kobonella 9·00; 20th Gammaduwa 8·73, Alagalla 8·25, Dooroomadella, 8·12; 21st. Rugam 8·54

Temperature was fairly evenly distributed and an examination of the offsets column will show that roughly speaking the northern half of the island was a trifle below, and the southern half above average though only in the cases of Nuwara Eliya and Hakgala did these differences exceed 1°F.

Amount of cloud and humidity were both above average and the mean wind velocities were also above the average for December at all stations except Colombo, where the mean for the month was just below average despite some high velocities on and about the 21st. In addition to the figures supplied from stations that are supplied with anemometers, comments on unusually high wind were received from a number of other stations e.g. West Haputale.

A. J BAMFORD,
Supdt. Observatory.